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ABSTRACT

This is the first part of a national study on science instruction in elementary schools in the United States. Questionnaires (copies appended) sent to the principal and a randomly selected science teacher in 3342 public elementary schools, selected by multi-stage random samples of Great Lakes and Far West Regions schools, provided information about practices, procedures, policies and conditions concerning science education. Data received by July 1, 1971, (approximately 38 percent response) were analyzed and include information about teacher preparation, school organizational instructional methods, facilities for science, use of federal funds, the adoption of science course improvement project materials, teacher attendance at summer and other institutes, and teacher satisfaction. Chi square values resulting from a contingency table analysis of responses to teacher and principal questionnaires classified by school enrollment are reported. Some significant relationships concerning teacher preparation, use of funds, and facilities available are discussed. Trends since earlier surveys by other authors are discussed. (Author/AL)

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A SURVEY OF SCIENCE TEACHING IN THE PUBLIC ELEMENTARY SCHOOLS OF TWO SELECTED REGIONS OF THE UNITED STATES DURING THE 1970-1971 SCHOOL YEAR

By

Jerrold William Maben, Ph.D.
The Ohio State University, 1971
Professor Robert W. Howe, Adviser

The major problem of the study was to obtain information about the science teaching practices, procedures, policies and conditions prevailing during the 1970-1971 school year in the public elementary schools in two geographic regions of the United States. The study was one part of a six part national survey of elementary and secondary school science. The two regions studied were the Central States, comprised of Illinois, Indiana, Michigan, Ohio and Wisconsin, and the Far West States, comprised of Alaska, California, Hawaii, Nevada, Oregon and Washington. Sixteen sub-problems related to elementary school science programs, science budgets, science faculty, instructional procedures in science and science facilities were investigated.

The design of the study included a three stage

sampling procedure to randomly select a sample of over 3,000 elementary schools in the eleven states of the two geographic regions. Two structured questionnaires were sent to principals of the randomly selected schools. Principals randomly selected one of the teachers who taught science in their school to receive the teacher questionnaire. One science class was randomly selected by the teachers to obtain certain data for the teacher questionnaire. Determination of responding and non-responding schools was made. Follow-up was conducted.

Analysis of the data was conducted by standard computer programs. Much of the data output consisted of descriptive statistics. Chi square analysis was made where appropriate. The regional and large state sample sizes were determined to be adequate. No inferences about causal relationships were made. No generalizations were intended beyond those that could be stated relative to the principal and teacher respondents from the sample.

Conclusions from the data were made relative to regional and state data and to school enrollment size. Particular attention was given to significant similarities and differences in three areas: 1) the academic preparation of the elementary school teachers who taught science; 2) practices related to school organization, teaching procedures and facilities for science instruction;

and 3) funding for elementary school science. Trends in elementary school science were identified.

A SURVEY OF SCIENCE TEACHING IN THE PUBLIC ELEMENTARY SCHOOLS OF TWO SELECTED REGIONS OF THE UNITED STATED DURING THE 1970-1971 SCHOOL YEAR

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Jerrold William Maben, B.A., B.S., M.Ed.

* * * * *

The Ohio State University
1971

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JWM

December, 1971

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CHAPTER I

INTRODUCTION

THE PROBLEM

Statement of the Problem

The major problem of this study was to obtain information about the science teaching practices, procedures, policies and conditions prevailing during the 1970-1971 school year in the public elementary schools in two geographical regions of the United States. Sixteen subproblems related to the elementary school science program, science budget, science faculty, instructional procedures in science and science facilities were investigated.

Introduction and Need for the Study

Science has been taught in many U.S. elementary schools for more than half a century. Emphasis on science in these schools has varied as have science purposes, methods, resources, and teachers. State education laws listing required subjects have also varied, and in some cases have omitted elementary school science entirely. Publishers have developed scores of elementary science textbooks series plus myriad supplementary textbooks, trade books, films, activity kits and other elementary science materials. Individual school systems have developed their own curriculum guides and instruction materials. As a consequence of all these factors the nature of elementary school science instruction has shown considerable diversity.

It has been shown that science has in many ways been neglected in elementary schools. As recently as 1962, about half of the schools surveyed in a representative national study reported that their science equipment and supplies were far from adequate or completely lacking (5).

In the past decade many forces have influenced elementary school science instruction. Concern about the nature of science teaching and learning in elementary schools has been the cause of much public debate in the United States. This concern, spurred on by the great public interest in science, the space race, and varying manpower needs of an industrial and technological society, has expressed itself in the series of science course improvement projects, largely supported by federal funds such as Science--A Process Approach (S-APA), Elementary Science Study (ESS), Conceptionally Oriented Program in Elementary Science (COPES), Science Curriculum Improvement

Study (SCIS), and the Earth Science Curriculum Project (ESCP), to up-date and alter the orientation of science teaching and learning in the schools. Introduction of secondary school science curriculum improvement project courses, such as the Physical Science Study Committee (PSSC), physics, the Biological Sciences Curriculum Study (BSCS), biology, and the Chemical Bond Approach Project (CBA), chemistry, have stimulated interest in and concern about elementary school science. In addition, federal funds via the National Defense Education Act (NDEA) and the Elementary and Secondary Education Act (ESEA) have been made available for elementary science facilities and equipment.

To date, the National Science Foundation and the United States Office of Education have invested over one hundred million dollars in elementary and secondary science and mathematics curriculum projects. The lesser portion, however, has been at elementary levels. Much money, time and effort have also been spent on institutes and workshops held to facilitate implementation of science course improvement projects and to up-date and improve the teaching methods of secondary teachers and, to a lesser extent, elementary teachers in science.

As the decade of the 1960's came to a close, educators in general and science educators in particular, were expressing concerns about the impact of these efforts on student learning in science. The National Science Foundation (30) for example, raised the issue of implementation, adoption and effective use of science course improvement project materials.

One vital question which emanates from these concerns is: Who studies what science in the public schools? During the last fifteen years, emphasis has been placed upon academically able students, especially science oriented students. Concurrently, the nation's attention was directed toward environmental problems and public education was focused on educationally disadvantaged students, many of whom terminate their school programs shortly after completion of elementary school grades. What science is being offered to inner-city, urban and rural youth is a question of significance. Hurd (21) has suggested education in the sciences must be based on information that has survival value for learners. In short, concerns exist for "relevant education;" but what science has been designated for students in different grade levels, geographic regions and school types has not been fully clarified.

Problems of relevant education lead directly to questions about elementary science curriculum content and design, and the kinds of teaching strategies that have been used. Most new science course improvement projects developed or implemented during the 60's included discovery or inquiry approaches to science learning, in which the "processes" of science received emphasis. Taba (43) has noted with interest that most current science curriculum projects began in an effort to strengthen content and in doing so have renewed long developing emphases on discovery processes. However, there is a lack of complete information about facilities, instructional materials, and science teaching patterns in schools which have adopted new science courses.

Another major difficulty lies in an absence of current and accurate information on total enrollment in science and in the various science courses. One example of the problem, cited by both Welch (47) and Watson (46) for the secondary school level, was a confusion produced by science enrollment data from different sources which utilized different collection techniques. Welch pointed out that three separate studies, Haworth (19), Educational Services, Inc. (16) and Watson (45), produced three different sets of science course enrollment figures in 1964-65; thus inducing uncertainty about the accuracy of any of the reported figures. Similar situations appear to have existed with other science course improvement projects. A comparison of enrollment figures (47) reported by the National Science Foundation and the U.S. Office of Education showed the lack of just bases for appraising rates of acceptance and impact of new science improvement courses.

Due to greater numbers of elementary schools than secondary schools, differences in curricular organization among elementary schools and other factors, questions about adoption of science programs and textbooks are even more complex from kindergarten through grade six. For example, Lockard (27) reported 7,500 teachers used Elementary Science Study (ESS) materials in the 1967-68 school year. For 1968-69, Rogers and Voelker (39) reported 40,000 teachers used ESS materials. These values were determined using commercial sales figures as a base. Enrollments were extrapolated using twenty-five students per class. Comparison of the two years would suggest a high implementation rate of this one science course improvement project. Consideration of an implementation estimate including factors such as materials shared by more than one teacher, those purchased but left unused, or used with only a few students points out additional complexities of adoption questions. To illustrate with another science course improvement project, it has been reported recently by the developers (2) that two million children were receiving instruction using Science--A Process Approach (S-APA) materials during the 1970-71 school year. A basic question arises: To what extent of the total science program are schools utilizing materials developed as part of science course improvement projects and/or basal science textbook series?

Further questions have been raised by curriculum workers, researchers, and those responsible for selection, administration and implementation of elementary science programs. These questions include: To what extent is science an integral part of elementary school curricula? What audio visual materials are being used? How are classes organized for learning science? To what extent are schools utilizing funds available under the National Defense Education Act (NDEA) or the Elementary and Secondary Education Act (ESEA)? Are in-service training experiences being provided or utilized by those who teach science? The most recent formal study of national elementary school science teaching practices was conducted for the 1961-62 school year. Data used for sample determination in that study were for the 1959-60 school year.

National studies that have been undertaken to investigate the status of science teaching and learning in the elementary schools were completed before wide-spread adoption of new science course improvement projects into school curricula. Blackwood (5) examined the national status of elementary science teaching and utilized a questionnaire administered to elementary school principals during the 1961-62 school year. Brandow (7) studied elementary school science curricular organization and approaches to elementary science teaching through use of questionnaires sent to state departments of education and selected city schools during the 1958-1959 school year. Bruns and Frazier (8) reported a study in 1958 of elementary science curricula in 21 major cities based on examination of materials published by schools in those cities.

Since these studies, there have been no formal nationwide investigations of science teaching practices in the public elementary schools. It should be noted that none of these studies included concurrent elementary and secondary surveys of similar magnitude. Thus, there has been no comprehensive basis for answering many questions about science teaching and learning except by opinion based on general observations or on state and local studies. Fundamental questions that need answers include: How much background does the average elementary school science teacher have in science related areas? Has he participated in inservice science programs in the last three years? To what extent has he adopted the new approaches to science teaching? Do conditions in his school and community encourage him to do so? How satisfied is he with teaching elementary school science? Therefore, it seemed appropriate at this time to undertake a wide study of science teaching in public elementary schools in two major geographic regions of the United States in order to collect definitive data which would answer several of the vitally important questions.

It was apparent that valid and reliable information was needed at the end of this decade in which more attention had been given to improvement of elementary school science than in all previous history of U. S. education. It was the hope and intent of the present study to fulfill at least a part of this need.

Problem and Sub-Problems

The problem of this study was to obtain data about science teaching practices, procedures, policies and conditions prevailing during the 1970-1971 school year, from representative public elementary schools within eleven U. S. states of two geographical regions. The states, by region, were: Far West Region--Alaska, California, Hawaii, Nevada, Oregon, and Washington; Central Region--Illinois, Indiana, Michigan, Ohio, and Wisconsin.

The basic problem was further divided into the acquisition of descriptive data relative to sixteen questions or sub-problems, listed below and on page 11, about sampled schools in each state concerning school organization and scheduling for science; characteristics of science faculty; adequacy and nature of science supplies, equipment and facilities; science course offerings; instructional procedures and materials; inservice education; conditions for effective science teaching; and satisfaction with science teaching. All of these are described in Tables 5 through 90, pp. 162-248, by use of percentage differences. Data concerning selected questions were also sought in relation to school enrollment size. Selected variables associated with the sub-problems were analyzed for significance by use of chi square. The sub-problems were the following:

A. What were the organizational and scheduling patterns?

B. At what grade levels was science taught not at all, for less than half a school year, for half a school year, or more than half a school year?

C. What was the extent of the training and experience of elementary teachers who taught science as reflected by undergraduate and graduate credit hours in science and science education, number of years teaching experience, and the number of years of experience in teaching science?

D. At what grade levels was science taught by unassisted classroom teachers, teachers with consultant help, special science teachers or teachers with science educational television available?

E. To what extent were science equipment and supplies considered adequate?

F. At what grade levels were special science facilities available in classrooms where science was taught?

G. What types of equipment and audio visual aids were available for teaching science?

H. At what grade levels were science course improvement project materials used?

I. What were the practices regarding adoption and use of science textbooks and curriculum materials?

J. Were definite procedures used to identify children with special interest in science?

K. To what extent was environmental education taught with science?

L. To what extent was health taught with science?

M. What were the predominant instructional techniques used by elementary science teachers?

N. What was the availability and usage of supervisory and consultant help and inservice education for teachers?

O. What factors did teachers consider important in maintaining a high quality science instructional program?

P. How satisfied were elementary teachers with teaching science?

Definition of Terms

The terms used in this study are defined at this point to provide information relevant to the problem of the study.

1. Public Elementary School: an educational institution operated on public funds, under a principal or head teacher, including any combination of grade levels from kindergarten through eighth, except any upper grades under a secondary school organization. This definition excludes all private, parochial or diocesan elementary schools, and special schools for the blind, the partially blind, the deaf, dumb, emotionally-disturbed, and physically or mentally-handicapped children.
2. Elementary Science Class: a regular grouping of students for the purposes of science instruction in any grade or combination of grade levels, kindergarten through eighth, including any pattern such as team teaching, ungraded, traveling teacher, self-contained, departmentalized, etc., in a public elementary school as defined above.
3. Teacher: a person employed to instruct pupils or students in situations where the teacher and students are in the presence of each other.

4. Elementary Science Teacher: a teacher who teaches at least one science course, class or subject in any grade level or combination of grade levels in any organizational pattern.

5. Science Course or Subject: a course of studies designated as "science" by individual schools or school systems.

6. Science Course Improvement Project: a course or program of studies in any area of science developed by a group of individuals, under the sponsorship of the National Science Foundation, universities, school systems, state departments of education, or other educational organizations, to improve instruction in that area of science.

7. Conventional Science Course: a course or program of studies in any area of science which is not a science course improvement project.

8. Full-time Teachers: those teachers who occupy positions which require them to be on the job on school days, throughout the school year for at least the number of hours the schools in the system are in session.

9. Part-time Teachers: those teachers who occupy positions which require less than full-time service. This

includes those teachers employed full-time for part of the school year, part-time for all of the school year, and part-time for part of the school year.

10. Regularly Employed Teachers: those teachers who are placed on the regular faculty salary schedule. This definition includes both full-time and part-time teachers but excludes substitute teachers.
11. Substitute Teachers: persons who are employed to teach on a day-to-day basis, temporarily replacing regularly employed teachers.
12. Unit Population: this is the number of students, both elementary and secondary, that determines the selection of one public elementary school in the subsample of public elementary schools for each state.
13. Selection Numbers: these are small whole numbers selected from a table of random numbers, which constitute the basis of the selection criteria for randomly selecting elementary science teachers and science classes.
14. Elementary Science Teacher Selection Criteria: the method developed to be used by principals of elementary schools randomly selected in the study to randomly select one elementary teacher who teaches science in their school.

15. Science Class Selection Criteria: the method developed to be used by the randomly selected elementary science teachers to randomly select one science class in those instances when more than one elementary science class is taught by that teacher under any organizational pattern.

16. Elementary School Scheduling Pattern: the method of scheduling students in an elementary school for science instruction by a departmentalized or non-departmentalized manner.

17. Special Science Teacher: a teacher designated by the school system as a special science teacher, attached either to a specific school building(s) or a central office.

18. Science Equipment: non-consumable, non-perishable science items such as microscopes, scales, models, aquaria, etc.

19. Science Supplies: consumable, perishable or easily breakable science materials that must be replenished such as chemicals, dry cells, glassware, electric bulbs, copper wire, etc.

Assumptions

Assumptions relating to the investigation were:

1. There was a need to obtain accurate, reliable and relevant information regarding the practices, procedures, policies, and conditions of science teaching in public elementary schools of the two selected regions of the United States.
2. The descriptive survey was the most practical way of obtaining the needed information.
3. The instruments designed by the investigator were able to elicit the desired information from elementary school principals and elementary teachers.
4. The sample of public elementary schools was representative of the population of public elementary schools in the two selected regions of the United States.
5. The sample of elementary school teachers who teach science was representative of the population of elementary school teachers in the two selected regions of the United States.
6. The respondents to the survey instruments were representative of the sample.

Delimitations of the Study

Delimitations of the study were:

1. The population of school districts consisted of only those school districts listed in the Education Directory, 1968-69: Part 2--Public School Systems (17), within the eleven states.
2. The public elementary schools within school districts were limited to those listed in the respective 1970-71 state education directories, published by the appropriate state governmental units.
3. The U.S. total student enrollment data, and the individual state enrollment data used to determine the number of public elementary schools sampled per state was limited to those given in Barr and Foster's Fall 1968 Statistics of Public Elementary and Secondary Day Schools (4).
4. The student enrollment data for school districts used to determine the number of public elementary schools sampled per district or combination of districts was limited to those given in the Education Directory, 1968-69: Part 2--Public School Systems (17).
5. The data gathered with respect to the science teaching practices, procedures, policies, and conditions in the public elementary schools were

limited to those prevailing for the 1970-71 school year.

6. The study was not an evaluation but was a description of current science teaching practices, procedures, policies, and conditions in public elementary schools.
7. The study made no comparisons with data from states that were not included in the eleven states within the two regions stated.
8. The study made no comparisons with data from regions other than the stated Far West and Central States Regions.
9. The present study was one part of a three part study of U.S. elementary schools and a coordinated part of a concurrent study of U.S. secondary schools.
10. Data were analyzed from questionnaires received as of July 1, 1971. Questionnaires received after that date will be analyzed for a later report.

Limitations of the Study

Limitations of the study were:

1. The extent to which the Principal's Questionnaire was a valid and reliable measuring device for obtaining information about elementary school organization, scheduling, teaching staff, science

budget, course offerings, and inservice education.

2. The extent to which the Elementary Teacher Questionnaire was a valid and reliable measuring device for obtaining information about teacher characteristics, special science facilities, equipment, supplies and audio visual aids, effective science teaching factors, and elementary science teaching.
3. The extent to which the "Elementary Science Teacher Selection Method" was used by the principals of the randomly selected elementary schools to randomly select elementary teachers who teach science to receive the Elementary Teacher Questionnaire.
4. The extent to which respondents, who returned questionnaires as of July 1, 1971 were representative of those from whom questionnaires were not received.
5. The extent to which differences in date of receipt of the questionnaire was productive of reliable data.

Significance of the Study

In addition to providing answers to the problem mentioned above, the results of the study are expected to have important implications for: (1) procedures and analytical techniques to be used in Parts II and III of the National Elementary School Science Study; (2) school administrators and science teachers engaged in science curriculum revision and development; (3) college administrators and science educators concerned with developing preservice and inservice elementary teacher education programs; (4) researchers who are concerned with follow-up and trend analysis studies; and (5) design of future survey studies.

PROCEDURES

General Procedures

The design of the study included a multi-stage random sampling of public elementary schools from the population of public schools in eleven states. Two structured questionnaires were sent to principals of randomly selected schools. A classroom teacher was randomly selected to receive one of the questionnaires. A science class of that teacher was randomly selected to obtain certain data for the teacher questionnaire. Gathered data were coded and transferred to computer cards for analysis and summary by standard computer programs. Much of the data output consisted of descriptive statistics. Chi squares were computed where appropriate. No inferences were made about causal relationships.

The Population

The population consisted of all public elementary schools in the States of Alaska, California, Hawaii, Illinois, Indiana, Michigan, Nevada, Ohio, Oregon, Washington, and Wisconsin.

The Sample

The nature of the investigation required a three-stage sampling: Stage I, the selection of the public elementary schools; Stage II, the selection of the elementary teachers who teach science; and Stage III, the selection of the science classes from which specific data on science teaching practices were desired. The total number of elementary schools sampled in the eleven states was approximately 3,400.

Instrumentation

The data were gathered by means of two structured questionnaires: the Principal's Questionnaire and the Elementary Teacher Questionnaire. The Principal's Questionnaire contained twenty-one items grouped into six sections and was designed to obtain summative data for all science teachers and science classes in the school. The Elementary Teacher Questionnaire contained nineteen items in four sections and was developed to provide information concerning characteristics of elementary teachers, the conditions under which science instruction took place, and the approaches used to teach science.

Analysis of Data

Data gathered by the Principal's Questionnaire and the Elementary Teacher Questionnaire in the form of item responses were coded and transferred to computer cards. Analysis and summary was done by standard computer programs. A number of computer program revisions and modifications were made necessary to accomodate the number of variables and cases included in the study. Analysis of the data was conducted mainly using descriptive statistics and utilizing chi square techniques where appropriate.

OVERVIEW

The dissertation includes five chapters:

Chapter I: Introduction and general overview of the study.

Chapter II: Review of the Literature. This is reported in the following sections:

1. National Studies
2. Regional and State Studies
   a. Studies up to 1960
   b. Studies since 1960

Chapter III: The Study-Design and Method. This is discussed in the following sections:

1. Overall Design
2. Population and Sample
3. Instrumentation
4. Data Collection Procedure
5. Statistical Analyses

Chapter IV: Analysis of Results. This is discussed in the following sections:

1. Introduction
2. Administrative Provisions for Elementary School Science
3. Elementary Science Teacher Characteristics
4. Elementary Science Materials, Supplies, Equipment and Facilities
5. Patterns of Science Teaching
6. Consultant Services and Inservice Education in Science
7. Barriers to Effective Science Teaching
8. Teacher Satisfaction with Teaching Elementary School Science
9. Summary

Chapter V: Summary and Conclusions

CHAPTER II

REVIEW OF THE LITERATURE

INTRODUCTION

This chapter is devoted to review of literature which relates to problems and sub-problems of the present study. Included are studies which investigated the status of elementary science teaching practices, procedures, policies and conditions, particularly those using designs which related to development of procedural methods for the present study. In order to present a perspective to elementary school science during the period reviewed, studies which have surveyed national, regional or state conditions are presented.

This chapter is comprised of two sections. The first section reviews national studies relating to the present study. Particular attention is directed to Blackwood's study, pp. 25-32, which influenced questionnaire design and analytical techniques used. The second section, State and Regional Studies, is sub-divided into two parts: 1. Review of Related Literature to 1960, and 2. Review of Related Literature since 1960.

NATIONAL STUDIES

The review of the 1961-62 school year study conducted by the U.S. Office of Education and reported by Blackwood (5) was important to the present study for two major reasons. First, that study was the most comprehensive investigation of science in national public elementary schools which sought data related to questions asked by the present study. Second, the design of the Blackwood study had the greatest influence of previous research on the design developed for the present investigation.

Blackwood used mailed questionnaires sent to 1,680 individual elementary schools. The principal of each elementary school was asked to reply with help as needed from the teachers in that school. Schools selected to receive the questionnaire were determined through a two-stage sampling process. The first stage involved selection of a stratified sample of 1,597 school administrative units from the 34,050 units reported for 1959-60. A ratio was established for sampling fractions on the basis of five administrative unit enrollment size groups.

In Blackwood's second sampling stage a roster of all 18,866 public elementary schools within the selected school administrative units was used to draw the stratified sample from four elementary school enrollment size categories.

Follow-up was conducted by letter, telephone calls and telegrams and a subsample was made of the nonresponse group to represent the entire nonresponse group. By these means an equivalent of 1,476 returns for an 87 percent response was obtained.

Data related to six major questions of the present study were sought by Blackwood. These were: (a) What were the administrative provisions of time and organizational structure for teaching science in U.S. elementary schools? (b) Who taught science in public elementary schools? (c) What supplies, equipment, textbooks and facilities were available? (d) What patterns of science teaching described the ways science was taught in elementary schools (e) What consultant services and inservice education opportunities were available to those who taught elementary school science? (f) What were the barriers to effective science teaching? Major findings of the study related to administrative provisions of time and organization included the following:

1. In the kindergarten and first grade, approximately 4.5 percent of the elementary schools studied taught no science.
2. The number of schools not teaching any science in

grades two through six was negligible.

3. 15.1 percent of the schools were departmentalized for science at one or more grade levels.
4. In those schools offering science, the number of periods per week devoted to science at all grade levels varied from one to five.
5. In all grades at least 50 percent of the schools taught science three or more times per week.
6. At the kindergarten level over 43 percent taught science fewer than 40 minutes per week.
7. In grades one, two and three more than 74 percent taught science for more than 40 minutes per week.
8. In grades four, five and six, more than 67 percent taught science for more than 60 minutes per week.

Major findings of the Blackwood study in relation to the characterisics of those who taught elementary school science included the following:

1. For all grades, more than 80 percent of those teaching elementary school science were classroom teachers with no help from an elementary science specialist.
2. Below grade five the percent of special science teachers was negligible.
3. At grades five and six, 2.2 and 3.4 percent of the schools, respectively, had a special science teacher

on the school staff who taught science at one or more grade levels.

4. The use of science television instruction was most common in grades four, five and six.

The following were included among major findings by Blackwood related to science equipment, supplies, textbooks and facilities:

1. Overall, 54 percent of the schools indicated that the availability of equipment and supplies was very plentiful or generally adequate; the remaining 46 percent indicated that supplies and equipment were far from adequate or completely lacking.
2. Less than 18 percent of the schools reported that no science book was adopted in grades one through three, whereas over 23 percent reported using two or more science textbooks at those grade levels.
3. In grades four through six, 4.5 percent reported that no science book was adopted and 28.5 percent indicated two or more science textbooks were adopted.
4. For all grades, science was taught in a special room or in a regular classroom with special facilities for science in 15.4 percent of the schools.
5. The percent of schools reporting use of regular

classrooms for science decreased by grade from about 90 percent at the kindergarten level to 77 percent at grade six.

Findings by Blackwood concerning patterns of science teaching included the following:

1. The percent that taught science as a separate subject increased by grade level from about 24 percent in kindergarten to about 70 percent in grade six.
2. Science was taught most frequently as an incidental subject in the kindergarten, but comprised less than 10 percent of all schools in grades one through six.
3. From about 10 to 20 percent of the schools reported a combination pattern of separate subject and incidental, kindergarten through grade six.

The following were reported related to the availability and usage of consultant services and in-service education:

1. About 60 percent of all elementary schools reporting in the study indicated that teachers' meetings on science were offered.
2. Nearly two-thirds of all schools reported that they participated in science curriculum development and revision.

3. Over 65 percent of all schools had elementary science courses available to teachers.
4. Over half of all schools had inservice science workshops.
5. Visitations and demonstration teaching opportunities were provided in over 60 percent of all schools reporting.
6. About 40 percent of all schools used television or radio programs for inservice activities.
7. Less than half of the elementary schools had science consultant help available.
8. Of those schools having consultant help, about 50 percent rarely or never used the service in kindergarten through grade three; in grades four through six about 40 percent rarely or never used the available consultants.
9. Providing materials and planning or consulting with teachers were the two most frequently reported types of services used.

Thirteen barriers to effective science teaching were reported by Blackwood. The six most important barriers as listed below in order of overall ranking by respondents were:

1. Lack of consultant service.

2. Lack of supplies and equipment.
3. Inadequate room facilities.
4. Insufficient funds for science.
5. Insufficient science knowledge.
6. Lack of inservice opportunities.

To summarize, Blackwood found that the percentage of public elementary schools that did not teach science above grade one was negligible. The percent that taught science more than one-half year increased by grade from about 60 percent in kindergarten to almost 90 percent in grade six. The time devoted to science varied from less than 20 minutes to more than 161 minutes per week at every level kindergarten through grade six. Science was taught by a classroom teacher with no help from an elementary science specialist in over 80 percent of the reporting schools. The percent of schools reporting equipment and supplies as very plentiful, generally adequate, inadequate, and completely lacking were 8, 46, 35 and 11 percent respectively. Science consultant service in some form was available to over 40 percent of the schools and there was a variety of inservice activities available in most schools. The two highest ranking barriers to effective science teaching were lack of adequate consultant service and lack of supplies and equipment.

Although the Blackwood study was the largest in scope, there were other national studies. Brandow (7) conducted a national study of elementary school science during the 1958-59 school year. Questionnaires were sent to state departments of education in all 48 states and to 219 cities stratified into three size categories. An overall return of 82 percent was achieved, with 45 state departments, 87 out of 106 cities of over 100,000 population and 88 out of 113 cities of from 10,000 to 100,000 responding. In addition, interviews were conducted with educators in 18 states. Purposes of the study included collection of data on elementary school science curricular organization and typical approaches to teaching science. Findings of the investigation included the following:

1. The separate subject pattern reported increased from about 30 percent in grade one to about 50 percent in grade six.
2. The two next most popular patterns of teaching, in order, were; correlated and integrated, with 25 and 20 percent reported, respectively.
3. Incidental patterns varied from 16 percent in grade one to about 5 percent in grade six.
4. About half of the cities responding based their science program on the textbook.

5. About 30 percent reported use of multiple textbook adoptions.
6. No elementary science textbook was reported available by 14 percent.
7. Sixteen factors were reported as contributing to unsatisfactory science teaching of which eight were considered frequent enough to be meaningful. Inadequate teacher training in methods were reported by 53 percent of all respondents; teachers' lack of scientific knowledge was listed by 36 percent; and lack of teacher interest was given by 16 percent.
8. Lack of materials, equipment and books and inadequate supervisory help ranked sixth and seventh, respectively, among factors contributing to unsatisfactory science teaching.

One earlier national study conducted by Palmer (34) in 1930 in 42 states is of historical interest. Among other findings, he reported that superintendents indicated that teacher training was one of their greatest difficulties in elementary school science. In 1951, Burnett (9) concluded that elementary school science was taught mainly by textbook reading and discussion and Richardson (37) found that there was a general lack of science materials.

In 1957, Bruns and Frazier (8) conducted a study of 21 large city school systems from all parts of the U.S. by analyzing materials published by the schools and found that more than 50 percent organized science instruction around the same basic framework.

In summary, a review of national elementary school science surveys showed that considerable diversity had been reported in the areas of administrative organization; patterns of instruction; science instructional equipment, supplies and facilities; teachers who taught elementary science; the form of consultative services and inservice science education available; and the barriers to effective science teaching. Despite diversity, common characteristics were identified among the majority of schools studied during the period. Science in schools included in the studies was found to be generally taught at least three times per week for at least half a year as a separate subject for a total time of about an hour or less in the primary grades or greater than an hour and one-half in the upper elementary grades. The majority of science classes were taught in a regular classroom by a classroom teacher with no or infrequently used consultant help. Instruction was likely to be based on a single textbook and there was about a 50 percent chance that the science materials available were considered inadequate. Science inservice education for teachers was available in a majority of school systems, but the greatest barriers to effective science teaching stated appeared to be a lack of consultant service for classroom teachers, lack of instructional materials or facilities and inadequate teacher knowledge.

STATE AND REGIONAL STUDIES

State and regional studies have been conducted which relate to the present study. These studies varied from investigations of selected schools within a limited segment of state elementary schools, to studies of sample schools throughout a state and multi-state studies. Some studies in cities, states and regions other than those geographic locations included in the present study are reviewed because of the perspective they give to elementary school science during the period reviewed. Selected state and regional studies are reviewed in two sections: a) studies up to 1960, and b) studies since 1960. This division is used due to the major impact of the national Blackwood study conducted during the 1961-62 school year as well as for purposes of historical clarity in presenting the status of elementary school science as it relates to the present study.

Review of Related Literature to 1960

A study of historical interest was reported by Weller (48) in 1933. Schools in eight states, Alabama, California, Colorado, Connecticut, Michigan, Minnesota, New York, and Texas, were sampled on the basis of one school for every 200,000 population. A checklist was used to obtain data regarding elementary science from school principals. Among Weller's findings were the following:

1. Approximately 19 percent of the schools reported no definite instruction in science.
2. The average number of minutes per week devoted to science was 72. It was noted, however, that many respondents found estimation of the time to be difficult.
3. Considerable divergence was found among practices regarding use of courses of study as a basis for instruction.
4. Increased interest in science was indicated by approximately 74 percent of the respondents.

More recently, other status studies were conducted in various sections of the U.S. In 1955, Auletto (3) examined the teaching of elementary science in Delaware; in 1952 Bolen (6) studied facilities and practices in Oregon; Challand (11) investigated Illinois elementary science in 1956; Conrad (13) looked at Indiana practices in 1953; Johnston (25) worked in Minnesota in 1954; Piltz (35) studied barriers to elementary science teaching in 1955; and Schneider examined availability of materials and equipment in Iowa elementary schools during 1956. Similar conclusions were made from the respective studies during this period. It was reported that limited time was allotted in the school program for elementary school science instruction. Lack of materials, equipment and facilities were shown as difficulties identified to be barriers to effective science teaching. Another difficulty reported was lack of science knowledge on the part of elementary teachers who taught science. Textbooks were identified as a basic source for science instruction. Selected aspects from the above studies are discussed in greater detail below in order to illustrate the nature of these aspects of elementary school science in various geographic locations.

Challand (11) sought to appraise the status of elementary school science programs in Illinois. Data were obtained by sending questionnaires to 500 elementary teachers and to 300 graduates of the National College, Evanston, Illinois. About a 50 percent response rate was attained for both groups. Questionnaire items sought information on grade placement of science content, the methods used to determine topic areas, the context of elementary school science in terms of the total curriculum and time allotments for science instruction. Among findings related to the present study were the following:

1. Of all the teachers, 71 percent had most of their college science credit hours in biological sciences.
2. The average time allotment for elementary school science was about 120 minutes per week.
3. In general, a majority of the selected Illinois teachers utilized a single textbook which was the basis for determination of scope and sequence of science topics taught.
4. A larger percentage of early elementary teachers than upper elementary teachers used a single textbook.
5. Early elementary teachers were more likely than upper elementary teachers to integrate science with other subjects.
6. Less than one-third of the teachers reported allowing time for student participation in science classes.
7. Science field trips averaged about 1.5 trips per school year.

8. Inservice activities, including faculty meetings, workshops and conferences on science, were offered by about one-third of the schools.

In Iowa, Schneider (40) investigated the availability of materials and equipment for elementary school science instruction and the use of certain instructional procedures. Conclusions based on the study included the following:

1. The majority of Iowa elementary schools were not adequately equipped with science materials and equipment.
2. The population area in which a school was located had no direct bearing on the level of adequacy of science materials and equipment.
3. Science textbook reading and discussion was the most frequently used instructional activity in science.
4. Science experiments and projects were used infrequently for science instruction.
5. About 50 percent of the elementary teacher respondents reported that they were satisfied to teach science with a minimum of equipment.

Two questionnaires, one for elementary teachers and one for supervisors, plus personal visitations to five percent of his sample were used by Auletto (3) to study elementary school science teaching in Delaware. Investigated were teacher background in science, time alloted for science, content of elementary school science, and use of community resources. Included in his findings were the following:

1. For grades one through six, inclusive, the average number of minutes per week devoted to elementary school science were 40, 47, 55, 51, 54 and 77 minutes, respectively.
2. Less than five percent of the elementary teachers had credit hours in science equal to a major or minor subject area.
3. Three major barriers to effective science teaching were reported as lack of subject matter background in science, lack of time, and lack of confidence in ability to teach science.
4. Less than half the teachers reported that children did science experiments as a part of science instruction.

As part of a study to obtain data on the relative achievement of the objectives of elementary school science in Minnesota schools, Johnston (25) sent questionnaires to 478 school superintendents and to a random sample of 87 fifth grade teachers. Among her findings were emphasis on science textbook reading and discussion as science learning activities and limited use of science experiment activities.

Piltz (35) conducted a study in Florida to determine what factors elementary classroom teachers considered barriers to effective science teaching. His questionnaire was returned by 443 teachers from rural, suburban and urban region schools in 56 out of 67 Florida counties. Among characteristics of the teacher respondents it was found that almost 71 percent were over 30 years of age, 80 percent held bachelor's degrees while 11 percent had master's degrees and about 75 percent had had a college course or workshop on the teaching of science. Included in Piltz's findings of interest to the present study were the following:

1. A negligible percent age at all grade levels indicated that no science was taught.
2. From nine categories of science teaching the category of greatest difficulties was a lack of physical facilities, such as work space for student experiment, project and demonstration activities, storage space

for science materials, utilities for science activities and equipment.

3. Lack of time for science, lack of science knowledge, lack of interest in science and lack of science teaching methods were also given as major difficulties.
4. Textbook reading was the basic method of elementary science instruction.

To summarize reviewed regional and state elementary science status studies up to 1960, findings seem to reinforce the conclusions that sample schools in various geographic sections showed diversity, but, in general, elementary school science in the majority of schools suffered from inadequate facilities and materials. There were also indications that teachers felt a need for better backgrounds in science subject matter and in science teaching methods. The predominant learning activity utilized by elementary teachers who taught science was reading from a single science textbook accompanied by some discussion.

Review of Related Literature Since 1960

As previously noted in this chapter, the impact of Blackwood's study was a major one. In many ways, his investigation of elementary school science teaching practices during the 1961-62 school year had provided answers to fundamental questions about the status of elementary school science. The study may have also had the effect of directing science education researchers away from additional status studies. The direction of research in elementary school science also seemed to be changing. As Matala and McCollum (28) stated in their review of status studies of elementary-science programs, "status studies need to be made, but...increased emphasis needs to be placed upon research culminating in improved practices which can be shown objectively to be better than those previously used."

The 1960's were also the period of development of new curricula for elementary school science as noted in Chapter I. Further, an impact existed from federal funding of science equipment and remodeling of science facilities. As a consequence certain questions did remain to be answered by status studies during the sixties. Some of these were at the state level to determine if the conditions found nationally by Blackwood were typical of elementary school science in that state. Others were seeking direction for state committees developed for the improvement of science education or for implementation of National Defense Education Act (NDEA) and Elementary and Secondary Education Act funding for science education. The studies reviewed in this section are those conducted since 1960 which seemed to have particular relevance to the present study in light of the literature previously cited.

In one study of interest, Hedges and MacDougall (20) investigated elementary school science in the public white elementary schools of Virginia during the Spring of 1962. Four major areas were studied: (1) characteristics of elementary teachers who teach science; (2) adequacy of facilities, equipment and materials for elementary school science; (3) predominant teaching methods; and (4) barriers to effective science teaching. A sample of 151 teachers in 25 schools was selected for visitation and administration of inventories and achievement tests. The following conclusions from the investigation were related to the present study:

1. Very few field trips were conducted by the teachers studied.
2. Very few teachers used student group work or student experimentation as learning activities for science instruction.
3. The majority of schools did not have any science equipment.
4. Where science equipment was available, it was generally used in the upper elementary grades.
5. The need for equipment was frequently mentioned by the teacher respondents.

A study by Ricker (38) with findings related to the present study was conducted in the state of Maryland during the period. In 1963, Ricker reported a questionnaire type survey of a stratified random sample of 294 teachers in the 23 county school districts regarding utilization of science equipment in elementary schools. Baltimore city schools were excluded. Emphasis in the study was placed on factors that influence the utilization of science equipment. Data were collected on: (1) Who is responsible for teaching elementary school science; (2) What were the science and science education backgrounds of elementary teachers who teach science; (3) What patterns of science teaching were utilized; (4) Did teachers consider that lack of science equipment was a barrier to effective science teaching; (5) Did teachers participate in science inservice education activities. Ricker found the following that were related to the present study:

1. Of all the teachers surveyed, 20.1 percent did not possess a bachelor's degree.
2. More than 53 percent of the respondents had six or more years of teaching experience.
3. More than 75 percent of the teachers indicated they had had at least one course in elementary science education.

4. At least one course in biological sciences or physical sciences was reported by 54.7 percent and 32.2 percent of the teachers, respectively.
5. More than 53 percent of the teachers had participated in some type of inservice science education activity.
6. Overall, 5.2 percent of the schools reported a special teacher for science instruction.
7. The most frequently reported pattern of science teaching was separate subject. Overall, 45.3 percent reported this practice.
8. Integration of science with other subjects was reported by 36.7 percent of the teachers.
9. Incidental and other patterns were reported by 4.8 percent and 13.2 percent, respectively.
10. Use of multiple science textbooks was reported by 86.2 percent of the respondents.
11. Lack of sufficient time to teach science, reported by more than 47 percent, was the most frequently reported barrier to science teaching.
12. Lack of science equipment was indicated as a barrier to effective science teaching by approximately one-third of the teachers.
13. Lack of science knowledge and lack of an understanding of science teaching methods were reported by approximately one-fourth of the teachers.

Smith and Cooper (41) reported a study of frequency of use of eight selected teaching techniques by elementary teachers in a southern state during Spring, 1965. Data on frequency of use was reported by 1500 grades one through six teachers using mailed questionnaires. Usage responses for each category were: almost every class, frequently, occasionally, and almost never. For the responses almost every class, and frequently, the overall ranking of percentage of responses from high to low for each of the eight teaching technique categories were:

1. Discussion of text was reported by 84.7 percent of the respondents.
2. Reading of text was reported by 69.4 percent of the respondents.
3. Teacher demonstrations were reported by 55.4 percent of the respondents.
4. Individual or group projects were reported by 52.0 percent of the respondents.
5. Pupil observations were reported by 50.5 percent of the respondents.
6. Pupil experiments were reported by 49.1 percent of the respondents.
7. Visits to community resources were reported by 6.6 percent of the respondents.

8. Visits from resource people were reported by 2.7 percent of the respondents.

Another of these relevant studies was conducted in the state of Iowa. The investigation was of particular interest because, similar to the present study, it was one part of a companion study of secondary school science. Conducted by Snoble (42), the investigation of Iowa elementary school science was based on two surveys of schools during two different academic years. The first survey, conducted in May of 1963, was previously reported by Porter, Snoble and Anderson (36). The second survey was conducted in September of 1966. The purpose of the investigation was to compare data obtained by the two surveys to determine the extent to which the public elementary schools of Iowa had adopted practices and methods which could be attributed to the adoption of the new philosophy of science teaching.

The population included 415 of the 469 approved four-year high school districts listed for the 1962-63 school year. Iowa school districts excluded were very small four year high school districts that the investigator felt would be reorganized by the time of the second survey. Also excluded were 164 non-high school districts. A stratified sample of 51 school districts from the 415 included was based on enrollment size and geographic distribution within the state. A total of 48 of 51 districts was used for analysis. Data were obtained by use of three-part interview check lists administered to one supervisor and one elementary teacher in each grade, grades kindergarten through six, in each of the 51 school districts.

Among Snoble's conclusions from the study were the following concerning administrative provisions of time and for elementary school science organization:

1. Approximately 75 percent of the teacher respondents reported no departmentalization for science in their school.
2. The average time devoted to science instruction varied from one hour or less per week in the kindergarten to two hours or more per week in grade six.
3. There was no significant change in the amount of time per week devoted to science at each grade level over the period of the study.

Concerning the characteristics of teacher respondents who taught elementary school science, Snoble found the following during the period of the survey:

1. Although approximately 30 percent of the 1966 respondents did not hold a bachelor's degree, this was an appreciable decrease from the approximately 50 percent who

did not hold a bachelor's degree in 1963.

2. There was no significant difference in the two surveys regarding the science and science education background as indicated by semester credit hours, of the teacher respondents.
3. In 1966, approximately 20 percent, 33 percent, 41 percent and 50 percent of the teachers, respectively, reported no semester credit hours in biological sciences, physical sciences, earth sciences, and science methods.
4. The reported percentage of teacher respondents who had attended no inservice science courses or workshops decreased from approximately 81 percent to 68 percent from 1963 to 1966.

The following were reported in relation to science facilities, equipment and supplies:

1. Approximately one-fourth of the schools in both studies were reported as having special science rooms.
2. Great range, from excellent to very poor, was found in the reported adequacy of supplies and equipment in both studies.
3. Approximately 75 percent in both studies rated equipment availability as good, very good or excellent.
4. The most frequently used teaching aid reported by

teacher respondents in both surveys was the bulletin board.

Snoble's study indicated the following concerning use of textbooks for elementary school science instruction:

1. The majority of teachers utilized a single textbook for science instruction.
2. The frequency of use, 65 percent in 1963 and 67 percent in 1966, of a single textbook did not appreciably change over the period of the study.
3. Textbook reading and discussion was the most frequently used method of instruction in elementary school science.

Concerning inservice education and consultant help for elementary teachers, Snoble reported the following:

1. More than 80 percent of the schools did not have science consultants available either year studied.
2. More than 50 percent of schools had not conducted science inservice workshops or science courses.

To summarize the results of the Snoble study in Iowa, most of the reported findings seemed to reinforce and repeat the results of earlier studies reviewed in this chapter. The one area which appeared to differ was adequacy of equipment and supplies. Snoble seemed to indicate that positive responses could be attributed to lack of felt needs for equipment and supplies since textbook reading and discussion was the major teaching method utilized by most of the respondents. Snoble concluded that textbook reading and discussion was firmly established as the most frequently used classroom method.

In 1966, Jarvis (24) reported an investigation of time allotments for science in grades four, five and six that was of interest to the present study. Surveyed were 64 school districts with student enrollments of from 500 to 1500 pupils in the state of Texas. The range reported for minutes per week categories was from 60-79 minutes per week to 300-319 minutes per week for science instruction. Most frequently reported by the school systems was a time allocation of 140-159 minutes per week. In both the fourth and fifth grades, 30 percent reported this category of time allocation, whereas 23 percent of the sixth grades reported 140-159 minutes per week for science instruction.

Dillon's (14) Maryland study was reported in 1966 and sought data in relation to the use of science consultants, patterns of science teaching, availability of facilities and equipment and inservice education in science. His study is of special interest to the present study since he made a direct effort to pattern his investigation after the Blackwood study. Two modified versions of the Blackwood questionnaire were administered to principals and teachers in 714 elementary schools.

Each questionnaire had six pages. Both questionnaires were sent to school principals; however, one half were mailed the principal's questionnaire only and the other principals were mailed the teacher's questionnaire only. The latter was to be given to any teacher at a designated grade level. Returns were received from 572 of the 714 schools. Concerning administrative organization for science Dillon found the following:

1. More than 70 percent of the schools reported teaching science at all grade levels.
2. Science was taught for a larger fraction of the school year in grades four, five and six than in kindergarten, grades one, two and three.
3. There was an increase in the median amount of time devoted to science from approximately 47 minutes per week in kindergarten to approximately 103 minutes per week in grade six.
4. Approximately 10 percent of the schools were departmentalized for science.

Concerning teacher characteristics, Dillon reported the following:

1. Approximately 12 percent of the teachers were male.
2. The highest percentage of male teachers (18.2 percent) responded from schools in the 50 to 399 school enrollment size group.

3. Overall, the median number of years experience was 12.2 years.
4. Less than ten years teaching experience was reported by 40.4 percent of the respondents.
5. A masters degree was held by 10.5 percent, a bachelor's degree by 72.6 percent and 14 percent reported not having a bachelor's degree.

Related to patterns of science teaching Dillon reported the following:

1. Approximately 18.5 percent of the respondents indicated that science was taught as a separate subject.
2. Approximately half reported that science was taught as a separate subject, but integrated when possible.
3. Science and social studies were reported as integrated by 18.5 percent of the schools.
4. Science was reported as taught most frequently as a separate subject in grade six (56.5 percent) and least frequently in kindergarten (18.2 percent).

Data from the study concerning science equipment and supplies were shown by Dillon to indicate the following:

1. Approximately one-third of the schools had petty cash funds for the purchase of science materials.
2. Many schools were unable to identify the amount of

money, especially on a per-pupil basis, budgeted and/or expended for science equipment due to variations in school accounting procedures.

Concerning the role of the teacher who taught elementary school science, the following were found:

1. Overall, approximately 66 percent of the teachers in kindergarten, grades one, two and three were regular classroom teachers with no help from an elementary science specialist; in grades four, five and six the percentage was approximately 56 percent.
2. A regular classroom teacher with help from an elementary science specialist from the central office staff taught science in about one-fourth of the schools in kindergarten through grade five; in grade six the percentage was approximately 21 percent.
3. A regular classroom teacher with help from a specialist on the school staff taught science in less than 4 percent of the schools at all grade levels.
4. Three percent or less of the respondents reported roles as: a) a special science teacher on the school staff; b) a special science teacher attached to the central office; or c) a classroom teacher with special competence in science trading classes with other teachers.

The type of classroom in which science was taught as reported in this state of Maryland study was found to be a regular classroom with no special facilities for science in 71.3 percent of the reporting schools. Of the remainder 17.7 percent indicated a regular classroom with special facilities was used; 0.8 percent reported a special science room and 5.7 percent gave no response on this item.

Again, Dillon found that the greatest number of teachers tended to use textbooks as a basis for science instruction.

Dillon reported the following related to the use of consultant help and inservice science education:

1. Consultant help of some form was available in more than 80 percent of the schools.
2. More than one-third of the available consultant help was in the form of a general elementary supervisor with only general knowledge of science.
3. Approximately 28 percent of the schools reported having science consultant help available.
4. Consultant help in science was most frequently reported as rarely or never used.
5. A variety of approaches were reported for science inservice education activities. The rank order for the most frequently used activity to the least used

was: curriculum meetings, workshops, courses, television and radio programs, teachers' meetings and visitation demonstrations.

In relation to the degree of difficulty which thirteen factors previously investigated by Blackwood offered to effective science teaching, Dillon reported the following, in order of difficulty, as the six factors ranked highest in level of difficulty:

1. Inability of teachers to improvise materials and equipment.
2. Inadequate room facilities.
3. Inadequate science teaching methods.
4. Lack of supplies and equipment.
5. Insufficient funds for purchasing needed supplies and equipment.
6. Lack of science knowledge.

Since modified versions of the Blackwood questionnaire were used, Dillon compared his results with those reported by Blackwood. Comparisons were made by expressing comparable data as frequencies and applying the chi square test. Collapsed data were used where appropriate. A null hypothesis of no significant difference at the .05 level was used. With only one exception, no significant differences were found between the national study and the Maryland study.

To summarize reviewed state and regional elementary school science status studies since 1960, most investigators have reported similar findings. Administrative provisions for elementary school science appeared to insure definite places in curricula for science instruction in the vast majority of schools; however, emphasis, based on time and periods per week and fraction of the school year science was taught, seemed greater in upper elementary grades than in the primary grades, especially kindergarten. The regular classroom teacher appeared to continue to be the individual responsible for science instruction, although various types of science specialists were available in a limited number of elementary schools. Single science textbooks were the predominant basis for a science program dominated by reading and discussion. Some teachers were using science demonstrations, science group work, science field trips and a variety of instructional aids. The National Defense Education Act (NDEA) and the Elementary and Secondary Education Act (ESEA) were providing funds for science facilities and equipment; however, in many areas, science materials and supplies were often categorized as inadequate. Inservice education and consultative services were not available in all schools and in those having these services, a significant percent of the classroom teachers did not use opportunities available.

SUMMARY

The literature shows a definite lack of information regarding the status of elementary school science in our nation's schools since 1963. Past studies have tended to reinforce mutual findings; however, variation has been shown to exist. Further, a ten year period has elapsed since a major national investigation and five years or more have elapsed since regional data relating to the present study have been reported and none of these have used samples large enough to permit detailed analysis of regions and states.

Two studies in particular (5,14), apparently have demonstrated practical procedures for acquiring data about elementary school science by the use of mailed questionnaires to principals and teachers. Certain difficulties have been noted in relation to acquisition of some data types.

CHAPTER III

THE STUDY--DESIGN AND METHOD

INTRODUCTION

The design of the study included a multi-stage random sampling of 3,342 public elementary schools from the population of public elementary schools in six far western and five central states. Two structured questionnaires were developed, and sent to principals of randomly selected public elementary schools. A classroom teacher was randomly selected within each school and one science class of that teacher was randomly selected. A follow-up mailing to selected non-respondents was conducted. Gathered data were coded and transferred to computer cards for analysis and summary by standard computer programs. A number of computer program revisions were made to accomodate the number of cases and the number of variables dictated by the study. Much of the data output consisted of descriptive statistics. Chi squares were used to analyze the sub-problems given in Chapter I in relation to school size. No causal relationship inferences were made.

This Chapter is divided into the following sections:

1) The Population; 2) The Sample; 3) Instrumentation; 4) Data Collection Procedures; 5) Analysis of Data; 6) Reliability of Data and Adequacy of Sample Size and 7) Summary.

THE POPULATION

The population consisted of all 20,866 public elementary schools in the states of Alaska, California, Hawaii, Illinois, Indiana, Michigan, Nevada, Ohio, Oregon, Washington and Wisconsin as listed by Gertler (17). For study design purposes of a total study of U.S. elementary school science, the population for this study was subdivided into two regions: the Central States and the Far West States. Given below is the reported number of elementary schools in each state of the two regions which comprised the total population:

FAR WEST REGION		CENTRAL STATES REGION	
State	Number of Elementary Schools	State	Number of Elementary Schools
Alaska	300	Illinois	3,293
California	5,465	Indiana	1,690
Hawaii	161	Michigan	2,687
Nevada	178	Ohio	3,187
Oregon	970	Wisconsin	1,777
Washington	1,158		

THE SAMPLE

Overview

The nature of the investigation warranted a three stage sampling design: Stage I, the random selection of public elementary schools within the states of the two geographical regions studied; Stage II, the random selection of elementary teachers who teach science in the selected schools; and Stage III, the random selection of science classes.

In Stage I, the number of schools to be selected from each of the eleven states within the Far West and Central States Regions was calculated on the basis of the ratio of their enrollment to the total United States elementary school enrollment. Comparable steps at state, county and district levels, respectively, determined the numbers of schools that were selected for the sample from the population in every district in every county in the eleven states within the two regions. Individual schools were then randomly selected from the alphabetical listings given in the state educational directories (1, 10, 18 22 ,23 ,29 ,31 ,32 ,33 ,44 , and 49) of the school districts within each state.

Stage II involved random selection of the elementary school teachers who taught one or more classes of elementary school science in any of the grade levels of the elementary school selected, grades kindergarten through eight. The class could be under any elementary school pattern, including such arrangements as self-contained, departmentalized, team teaching, ungraded, traveling teacher or exchange teacher. Random numbers given to the school principal indicated which teacher was to be selected from the alphabetical list of qualifying teachers.

In Stage III of the stratified sampling process, specific elementary school science classes were randomly selected. All of the science classes taught by the randomly selected elementary science teacher comprised the list from which the teacher randomly selected a class. The classes were arranged in sequence of the time they were taught. Random numbers for selection purposes were given to the designated elementary science teacher.

Features of the stratified sampling design included: 1) The sample constituted a high proportion of the population; 2) The sample size was exceptionally large; 3) All listed public elementary schools were included in the sampling process; 4) All elementary teachers who teach science were included in the sampling process; 5) All science classes taught by the selected teachers were included in the population for sampling; and 6) Random sampling procedures were used at all stages of the sampling process.

Stage I is discussed in the three sections of this chapter which follow: State Sample Size, State Sample Unit Population, and County and District Sample Determination. The next two sections discuss Stages II and III, respectively. Figure 1, p. 65, "Flow Chart of the Sampling Design," summarizes the overall stratification of the sampling design. A specific example of an application of the stratified sampling design is given in Figure 2, p. 75, "Flow Chart of the Sampling Design: An Example."

State Sample Size

For Stage I of the sampling design, it was determined that the number of schools to be sampled within each state of the two regions should be a function of total school enrollments within each state. For design purposes, a convenience figure of 10,000 schools was set as an ideal model if all U.S. regions were to be sampled. By this model, a procedure was established whereby the number of schools to be sampled in each individual state was computed as a ratio of the total enrollment of a given state to the total U.S. school enrollment as given by Kahn (26).

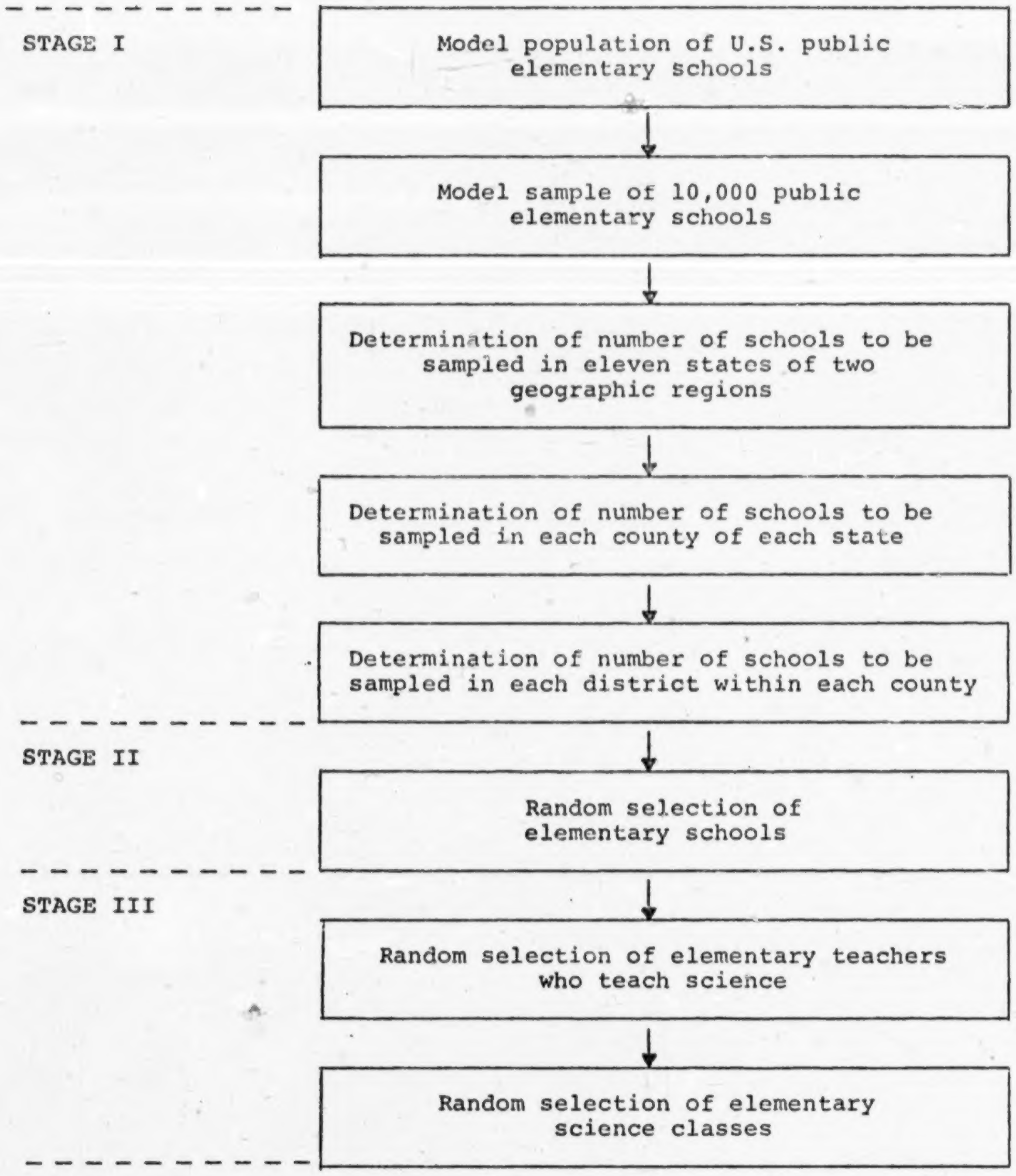

STAGE I
Model population of U.S. public elementary schools
Model sample of 10,000 public elementary schools
Determination of number of schools to be sampled in eleven states of two geographic regions
Determination of number of schools to be sampled in each county of each state
Determination of number of schools to be sampled in each district within each county
STAGE II
Random selection of elementary schools
STAGE III
Random selection of elementary teachers who teach science
Random selection of elementary science classes

Figure 1. Flow Chart of the Sampling Design.

Thus:

$$n_{\text{state}} = \frac{N_{\text{state (E)}}}{N_{\text{total (E)}}} \quad \text{X} \quad N$$

where n_{state} = number of public elementary schools to be sampled in a state

$n_{\text{state (E)}}$ = elementary school enrollment in a state

$n_{\text{total (E)}}$ = total U.S. elementary school enrollment

N = model sample size = 10,000 public elementary schools

For example, in the Central States Region, the determination of 621 elementary schools as the sample size in the state of Ohio was made in the following manner:

$$n_{\text{state}} = \frac{N_{\text{state (E)}}}{N_{\text{total (E)}}} \quad \text{X} \quad N$$

$N_{\text{Ohio (E)}}$ = 1,703,200 elementary school students

$N_{\text{total (E)}}$ = 27,418,423 elementary school students

Hence:

$$n_{\text{Ohio}} = \frac{1{,}703{,}200}{27{,}418{,}423} \quad \text{X} \quad 10{,}000$$

$$= 621 \text{ public elementary schools}$$

An important basis for this procedure was reduction of sample bias induced by variation in school building enrollments. In this way, the number of schools sampled in each state was a function of the reported numbers of school children in that state and was in relation to national enrollments. By application of the method the following model sample sizes were determined for each state:

FAR WEST REGION

State	Sample Size
Alaska	17
California	1055
Hawaii	36
Nevada	26
Oregon	123
Washington	163

CENTRAL STATES REGION

State	Sample Size
Illinois	537
Indiana	245
Michigan	437
Ohio	621
Wisconsin	207

A map is given in the appendix (Appendix B, p. 250) which shows the model state sample sizes in the two geographical regions and the model sample sizes for the remaining states and the District of Columbia.

Briefly, this phase of Stage I, determination of the state sample sizes, ensured that equal opportunity was given for state representation in the sample on the basis of the numbers of children listed as enrolled in elementary schools in each state in relation to the number of students listed as enrolled nationally in all U.S. elementary schools. Consequently, the state which had the greatest number of elementary school pupils had the largest number of schools sampled. The state with the second largest enrollment had the second largest sample, and so on, successively. The eleven states of the far west and central states in order of decreasing sample sizes were: California, Ohio, Illinois, Michigan, Indiana, Wisconsin, Washington, Oregon, Hawaii, Nevada and Alaska.

State Sample Unit Population

Succeeding state sample size determination, a means was employed to compute numbers of schools to be sampled within any educational unit or groups of units within states. Educational units included individual school districts, groups of districts, districts within a county or districts within grouped counties. The numerical value for the unit population for each state within the two regions was the ratio between the total school enrollment in the state and the sample size for that state.

Thus:

$$\text{Unit population for a given state} = \frac{N_{\text{state}(E,S)}}{n_{\text{state}}}$$

where $N_{\text{state}(E,S)}$ = school enrollment (elementary and secondary) for the state

It is to be noted that in this phase of Stage I, determination of state unit population numbers, a combined elementary and secondary enrollment figure was employed. There were several reasons for use of this method. First of all, data reported from some districts were readily available only as total enrollment values. Therefore, practical requirements resulted in utilization of combined elementary and secondary enrollment for state unit population determination. The result was uniformity in sampling procedures. Secondly, a variation existed in practices of what constituted elementary enrolled students and what constituted secondary enrolled students and the grade levels which each included. Again, uniformity was preserved by using combined elementary and secondary enrollments.

One consequence of the combined enrollment method was a possible slight weighting of sample size in the direction of those districts which contained a larger proportion of secondary to elementary pupils. One potential cause of this larger secondary proportion was an effect from retention power of the district. This would mean that the sample might have slightly favored districts that influenced larger numbers of students for longer periods of time. Provision was made in the analysis of data to determine relationships on the basis of enrollment size.

Using the above method, a unit population number was computed for each of the eleven states studied.

To continue the example of Ohio, the unit population was computed as follows:

$N_{Ohio(E,S)}$ = 2,384,160 students

n_{Ohio} = 621 public elementary schools

Hence:

$$\text{Ohio unit population} = \frac{2,384,160}{621}$$

= 3,839 students per public elementary school sample unit

Consequently, in Ohio, one elementary school was randomly selected for every 3,839 students in a district or group of districts. Application of the method to respective states of the two regions resulted in the following unit population values:

FAR WEST REGION

State	Unit Population
Alaska	4,204
California	4,342
Hawaii	4,784
Nevada	4,547
Oregon	3,982
Washington	4,933

CENTRAL STATES REGION

State	Unit Population
Illinois	4,233
Indiana	4,919
Michigan	4,859
Ohio	3,839
Wisconsin	4,609

County and District Sample Determination

School districts in each state were first grouped by county. The total school enrollment, elementary and secondary, of all school districts in a county was computed. This figure was divided by the unit population for that state to determine the sample size of public elementary schools in the county.

If the total school enrollment in a county was less than one half of the unit population, then the county was combined with one or more neighboring county(ies) to yield combined school enrollments which approximated one or more times the unit population. The number of public elementary schools to be sampled from this group of counties was determined by dividing the combined school enrollment by the unit population.

In the case of large school districts within a county, the total school enrollment in each school district was divided by the unit population to determine the number of public elementary schools to be sampled from each district.

In the case of small school districts within a county, two or more neighboring districts were combined, and their total school enrollment divided by the unit population to determine the number of public elementary schools sampled in the combined districts.

Continuing the example of Ohio, county and district sample sizes were computed in the following manner:

Total school enrollment in Franklin County = 177,707

Unit population for Ohio = 3,839

Number of public elementary schools sampled from the population of public elementary schools in Franklin County, Ohio = $\frac{177{,}707}{3{,}839}$

= 46 (nearest whole number)

Total school enrollment in the Columbus Public School District (a large district) = 105,123

Number of public elementary schools to be sampled from this school district = $\frac{105{,}123}{3{,}839}$

= 27 (nearest whole number)

Combining two small school districts - Grandview Heights and Upper Arlington, Franklin County, Ohio:

Total school enrollment in the Grandview Heights School District = 1,768 students

Total school enrollment in the Upper Arlington School District = 8,487 students

Combined school enrollment = 10,255 students

Number of public elementary schools to be sampled from the Grandview Heights and Upper Arlington school districts $= \frac{10,255}{3,839}$

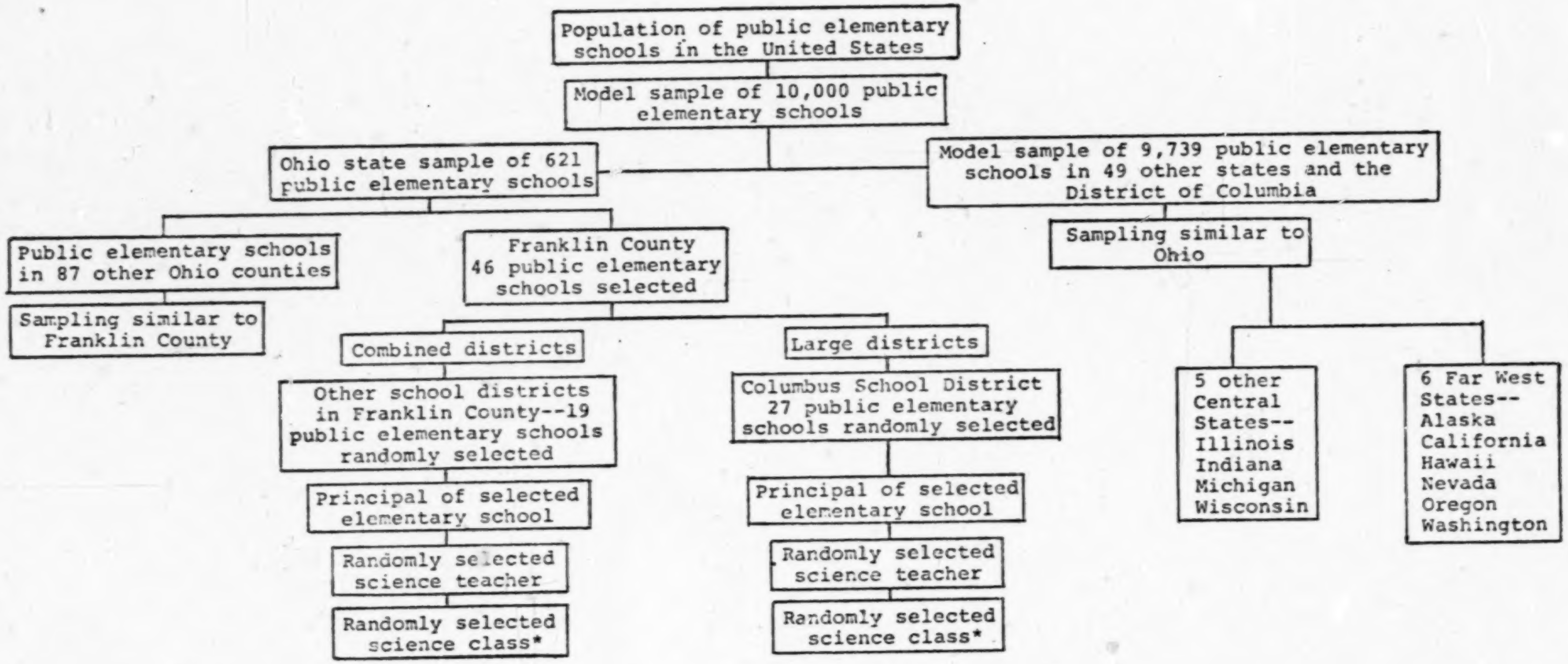
$=$ 3 (nearest whole number).

To complete Stage I of the sampling design, individual public elementary schools were randomly selected from alphabetical listings of public elementary schools in the selected school districts or a combination of school districts. Tables of random numbers were used in this phase of the sampling. The principals of selected public elementary schools were administered the Principal's Questionnaire by mail.

In summarization of Stage I of the three stage sampling design, the number of schools from the population of schools in the eleven states of the two regions to be sampled in each state was calculated on the basis of the ratio of the total listed elementary school enrollment to the total U.S. elementary school enrollment. Sample sizes for each state of the model are given in the appendix (Appendix B , p. 250). A unit population was calculated which indicated the number of enrolled elementary and secondary students that determined the selection of one public elementary school in sub-samples within each state, respectively. Unit population values for each state in the model are given in the appendix (Appendix B, p. 251). Then, the county and district or combination of counties and/or districts sample size was computed. Finally, individual elementary schools were randomly selected within the districts or combinations of districts. Figure 1, p. 65, "Flow Chart of the Sampling Design," diagrams the relationship of Stage I and the examples above to Stages II and III. The relationship of the example given above to the total sampling design is diagrammed in Figure 2, p. 75, "Flow Chart of the Sampling Design: An Example."

Elementary Science Teacher Selection

Stage II of the sampling design constituted random selection of an elementary teacher who taught science within each randomly selected elementary school. The technique employed inclusion of directions, the "Elementary Science Teacher Selection Method," along with the questionnaire sent to selected schools. Ten sets of random numbers were generated for the process. One set was randomly included as part of the questionnaire cover letter sent to each school principal. The principal was requested to (1) list in alphabetical order the last names of all


Population of public elementary schools in the United States
Model sample of 10,000 public elementary schools
Ohio state sample of 621 public elementary schools
Model sample of 9,739 public elementary schools in 49 other states and the District of Columbia
Public elementary schools in 87 other Ohio counties
Sampling similar to Franklin County
Franklin County 46 public elementary schools selected
Sampling similar to Ohio
Combined districts
Other school districts in Franklin County--19 public elementary schools randomly selected
Principal of selected elementary school
Randomly selected science teacher
Randomly selected science class*
Large districts
Columbus School District 27 public elementary schools randomly selected
Principal of selected elementary school
Randomly selected science teacher
Randomly selected science class*
5 other Central States-- Illinois Indiana Michigan Wisconsin
6 Far West States-- Alaska California Hawaii Nevada Oregon Washington

*Teachers having only one science class used that class for questionnaire Section IV data.

Figure 2. Flow Chart of the Sampling Design: An Example.

teachers in his school who taught at least one science class or subject in any grade level from kindergarten through eight, and (2) select a teacher on the alphabetical list, using the given set of selection criteria. An example of the Science Teacher Selection Method is given in Appendix B, p. 253.

Elementary Science Class Selection

In Stage III of the sample design, the selected elementary science teacher was requested to respond to all items concerning science teaching practices of the Elementary Teacher Questionnaire (Appendix C, pp. 269-277) with reference to one of his science classes selected randomly. The method used for random selection of a science class was applicable to various elementary school organizational patterns, such as self-contained, semi-departmentalized, departmentalized, team teaching and, non-graded. The method of randomly selecting a science class was as follows:

1. Elementary teachers who instructed only one science class, such as in self-contained organizations, responded to the items in Section IV of the Teachers Questionnaire (see Appendix C, pp. 274-277 in relation to that class. Teachers who instructed more than one science class, such as in departmentalized

organizations, selected a class for the data needed in Section IV by means of the method given in steps two and three below.

2. The elementary science teacher was requested to list his science classes in order, starting with the first science class that he taught each day, and ending with his last science class each day.
3. He then selected one of his science classes on the basis of selection criteria.

Ten sets of random numbers were generated for random inclusion as an integral part of the science class selection criteria included with each Elementary Teacher Questionnaire. An example of the directions given to the elementary science teachers is given in Appendix C, p. 274.

Summarizing, a three stage sampling design was used for the investigation. The design was developed to include a high proportion of the population of 20,866 elementary schools in the eleven states of the two geographic regions studied. The sample included 3,342 elementary schools, from the total listing of public elementary schools in the respective states. Random sampling procedures were utilized at each of the three stages of the sampling process. Stage I included determination of the number of schools to be sampled in each state, the computation of a unit population value for use in determining the number of schools to be selected in each sub-sample within the state and random selection of schools to which the investigative instruments were administered. Stage II comprised random selection of one teacher from among those who taught elementary school science in the selected elementary school. Stage III was the random selection of one science class from the number of science classes or subjects taught by the selected teacher. An overview is given diagramatically in Figure 1, p. 65.

INSTRUMENTATION

Overview

Data were gathered by means of two structured questionnaires called respectively the Principal's Questionnaire and the Elementary Teacher Questionnaire. The variables included in these instruments were identified by the investigator after (1) review of the literature related to science education in the schools of the United States; (2) consultations with his advisers, elementary teachers, administrators and supervisors, and graduate students in science education at The Ohio State University; (3) Trial administration of the questionnaires to selected principals and teachers.

A copy of the Principal's Questionnaire and the Elementary Teacher Questionnaire can be found in Appendix C, pp. 258-268 and Appendix C, pp. 269-277, respectively.

Principal's Questionnaire

The Principal's Questionnaire was designed to provide summative data for all the science teachers and science classes in the school. The instrument contained twenty-one items grouped into the following sections: (1) screening question, (2) school organization and scheduling, (3) teaching staff, (4) science budget, (5) course offerings in science, and (6) inservice education.

Elementary Teacher Questionnaire

The Elementary Teacher Questionnaire was designed to provide information concerning characteristics of elementary school science teachers, the specific conditions under which science instruction takes place, and the approach to the teaching of science under these conditions. The instrument contained nineteen items grouped into the following sections: (1) teacher characteristics, (2) special science facilities and audio-visual aids, (3) miscellaneous, and (4) elementary science teaching.

DATA COLLECTION PROCEDURES

Administering Procedures

A packet of associated data collection materials was prepared for administering to principals of the sample schools. Each packet contained the following:

1. Principal's Questionnaire (Appendix C, pp. 258-268).
2. Cover letter addressed to the Principal (Appendix B, p. 254).
3. Elementary Teacher Questionnaire (Appendix C, pp. 269-277).
4. Cover letter addressed to the teacher (Appendix B, p. 255.
5. Return addressed prepaid envelope for the Principal Questionnaire
6. Return addressed prepaid envelope for the Elementary Teacher Questionnaire.

Packets were personally addressed to principals of the sample schools. Packets were mailed by state over a four week period, in the following order:

Ohio
Washington
Hawaii
Alaska
Nevada
Illinois
Indiana
Oregon
Wisconsin
Michigan
California

Return Procedures

As questionnaires were received by return mail they were coded. Date of receipt of Principal and/or Elementary Teacher Questionnaires was recorded. Running totals and percentages of returns were kept. Returns were indicated upon receipt for each school in the sample.

Follow-Up

A re-mail instrument (Appendix C, p. 278) was developed and sent to selected initial non-respondents. Additional questionnaires were re-mailed as required. Those unable to participate in the study were removed from the sample. A cover letter was included with the re-mail packet (Appendix B, p. 256). Questionnaires returned after follow-up were dated and recorded for later analysis in Parts II and III of the National Elementary School Science Study. Additional follow-up will be conducted of non-respondents to the re-mail instrument and to selected categories of respondents to the re-mail instrument. None of these are reported in the present study.

Usable questionnaires received by July 1, 1971 were included in the analysis of data. Questionnaires received after July 1, 1971 will be analyzed in Parts II and III of the National Elementary School Science Study. Information on further follow-up and analysis is given in Appendix D, p. 281.

Phasing and Scheduling

The order of phasing and scheduling used for the study was as follows:

Begin	End	Activity
1/1/70	1/31/71	Selection of sample, printing of questionnaires
11/1/70	2/28/71	Preparation for first mailing
3/1/71	3/31/71	First administration of the questionnaires
4/1/71	7/15/71	Follow-up activities and analysis of data
5/16/71	8/1/71	Analysis of data

ANALYSIS OF DATA

In Chapter I, pp. 10 and 11, sixteen problems of the study were described. Variables related to these subproblems were analyzed by use of percentage differences, shown in Tables 5 through 90 , pp. 162-248. tion, selected variables were analyzed by use of chi square for significance in relation to school enrollment size as shown in Tables 2,3 and 4, pp. 147-162.

Standard computer programs for frequency count and chi square analysis were used. The frequency program was used to develop totals of responses to items in the two questionnaires which required selection of one or more choices such as the use or non-use of multiple textbooks, single textbooks, or locally prepared curriculum materials. Most of the data output was expressed in percentages, for

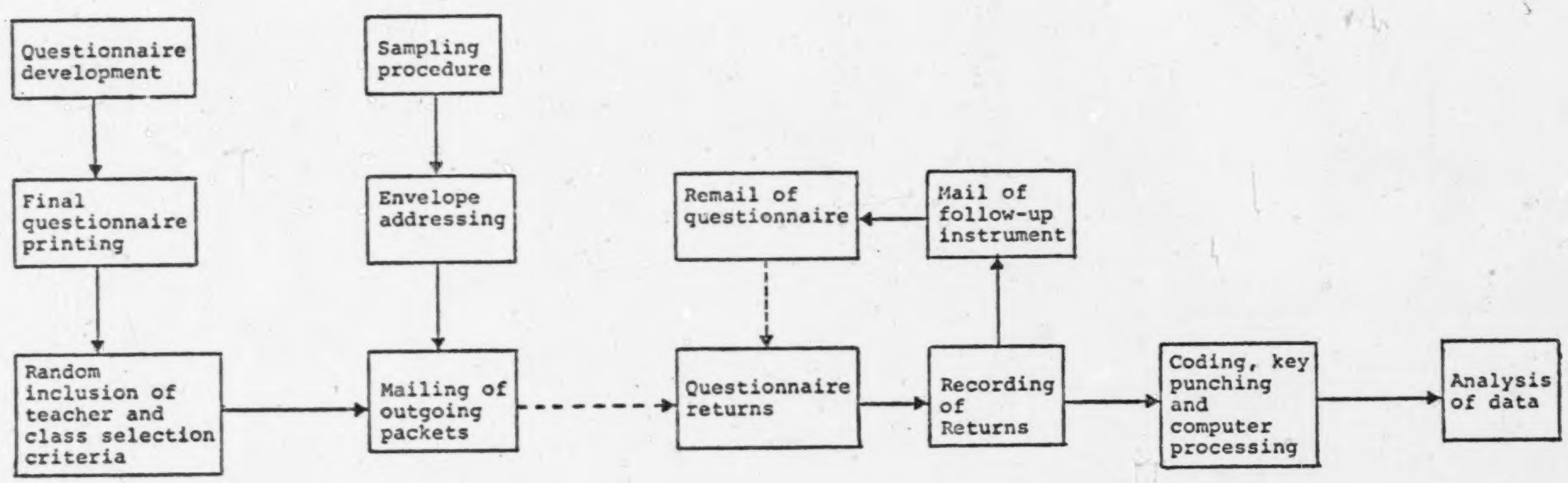

Questionnaire development
Final questionnaire printing
Random inclusion of teacher and class selection criteria
Sampling procedure
Envelope addressing
Mailing of outgoing packets
Remail of questionnaire
Mail of follow-up instrument
Questionnaire returns
Recording of Returns
Coding, key punching and computer processing
Analysis of data

Figure 3. Flow Chart of Data Collection and Analysis.

example, the percentage of teachers reporting that lack of supplies and equipment offered great difficulty to effective science teaching and the percentage of principals reporting equipment and supplies were adequate for certain grade level groups were computed. Data were grouped by state and region.

The BMD02S program was used for the chi square analysis. For example chi square tests were applied to selected teacher respondent variables to determine if a significant relationship existed between school size and the selected variables. The chi square test was also applied to principal respondent variables obtained from one state in each of the two regions. The data collection and analysis of data processes are diagrammed in Figure 3, p. 83, "Flow Chart of Data Collection and Analysis."

Variables were analysed for data from the principals' and teachers' questionnaires for kindergarten through grade eight. For purposes of reporting the present study in Chapter IV, data were analysed for kindergarten through grade eight.

RELIABILITY OF DATA AND ADEQUACY OF SAMPLE SIZE

A determination was made of the adequacy of the sample size and the number of responses. Response rates are discussed in Chapter IV, pp. 90-91. For determination of the adequacy of the sample size, the following formula was used to yield a confidence level for data used in the analysis:

$$\text{standard error} = \pm 1.96\sqrt{\frac{p(1-p)}{N}}$$

where p = percentage of responses on any variable

N = total number of responses on any variable

1.96 = constant for .05 level of significance used in present study.

The formula was used with selected state, regional and combined regional data to determine possible ranges of responses. Considering possible sampling error based on number and distribution of returns, the probable extreme confidence interval would be ±5.0 percent. For large state, regional and combined regional data the probable range of percentages of responses on given variables was determined to be approximately ±1.0 percent if additional sampling had been conducted under the same conditions as used in the present study.

In some large states, if percent of returns was low from very large cities compared with overall returns for that state, and if responses on given variables might have been significantly different from the remainder of the state, probable variation in responses was determined to be approximately ±2.0 percent. Chi square analysis based on school enrollment size also tended to confirm that response variation would be low in these cases.

For small states the possibility of change in responses is greater. However, trends indicated by the data were probably accurate; but actual percentages of responses on further sampling might vary considerably.

SUMMARY

A three stage sampling design was applied to randomly select a sample of over three thousand elementary schools in eleven U.S. states in two geographical regions. An eleven page questionnaire was administered to principals of the sample schools. The principals randomly selected, by the given method, one of their teachers who teaches science. The Elementary Teacher Questionnaire of nine pages was administered to that teacher. One science class of that teacher was randomly selected and data supplied referent to that science class. Determination of responding and non-responding schools was made. Follow-up of non-respondents was conducted.

Gathered data were coded and transferred to computer cards. Analysis was conducted by standard computer programs. Program revisions were made as necessitated. Data output was largely in the form of descriptive statistics. It was demonstrated that the regional sample sizes were adequate for the selected problems investigated and that an increase in sample size would not appreciably alter predictability. No inferences about causal relationships were made.

CHAPTER IV

ANALYSIS OF RESULTS

INTRODUCTION

The results of the status survey regarding the nature of elementary school science in eleven U.S. states within two geographic regions are presented in this chapter. Data were gathered in relation to the sixteen sub-problems enunciated in Chapter I, pp. 10-11. Responses from the two survey instruments were obtained on a total of more than 600 variables.

Discussion of results is organized relative to the eight aspects of the problem presented in Chapter I, p. 10. This is preceded by discussion of data related to questionnaire response percentages.

Data reliability and sample adequacy were discussed in Chapter III, pp. 84-86. It would appear that even very large increases in sample sizes both for geographic regions and for large states would not have resulted in appreciable differences in the percentages shown in the regional results. In the case of the very small states, Alaska, Hawaii and Nevada, it is recommended that generalizations from the results in this chapter be made with caution and awareness of the small sample size and numbers of schools reporting.

This chapter is divided into the following sections: Response Rate; Administrative Provisions for Elementary School Science; Elementary Science Teacher Characteristics; Elementary Science Materials, Equipment, Supplies and Facilities; Elementary Science Course Offerings; Patterns of Elementary Science Teaching; Consultant Services and Inservice Education in Science; Barriers to Effective Elementary Science Teaching; Teacher Satisfaction with Teaching Elementary School Science; and Summary.

Data from the two survey instruments are described in Tables 5 through 90, pp. 162-248, by use of percentage differences.

Chi square values for selected teacher and principal questionnaire variables are presented in Tables 2-4, pp. 147-161. Only those data which were statistically significant at the .05 level in relation to school enrollment size are discussed in this chapter. Chi square values for teacher questionnaire variables which were significant in relation to school enrollment size are given in Table 3, p. 153; and variables which were not significant are given in Table 4, p. 155. Table 2, p. 147, gives chi square values for principal questionnaire data from one selected state in each region: Indiana and Oregon. Variables significant at the .05 level in relation to school enrollment size are discussed in this chapter. Chi square tables referred to in this chapter do not include collapsed data. Information on collapsed data can be obtained upon request from the investigator. School enrollment size categories, after Blackwood (5) used in the analysis were: very small size schools, less than 40 students; small size schools, 40 to 399 students; medium size schools, 400 to 799 students; and large elementary schools, over 800 students.

RESPONSE RATES

The population of elementary schools in the eleven states of the Far West and Central States Regions was determined as 20,866 schools. The number of schools randomly selected for the stratified sample was 3,342 schools. This represents approximately 16 percent of the elementary schools determined as being in the two regions. Overall, about one school in six was sent the survey packet addressed by name, where available, to the building principal. Responses had been received from a total of 1,266 schools for an overall response rate of approximately 38 percent by July 1, 1971. The states in order of response rate from high to low were: Ohio, Washington, Hawaii, Oregon, Nevada, Indiana, Wisconsin, Michigan, Alaska, Illinois and California. By region the response rates for the purposes of this study were: Central States--41.1 percent; Far West States--33.3 percent. The total numbers of principal and teacher questionnaires received, the numbers of respective usable questionnaires, and percentages of returns by state and region are given in Table 1.

The total number of usable Principal's Questionnaires received by July 1, 1971 from which data were analyzed was 1,185. The total number of usable Elementary Teacher Questionnaires was 1,126. Tables 5 through 90, pp. 162-248, show the percentage differences obtained by analysis of these data. Tables 3 and 4, pp. 153-161, show chi square values obtained from an anlaysis of 815 Elementary Teacher Questionnaires which were matched for school enrollment size data with the respective Principal's Questionnaire from the same school.

ADMINISTRATIVE ORGANIZATION AND SCHEDULING FOR SCIENCE

Data related to administrative provisions of time, organizational pattern and scheduling for elementary school science are given in Table 2, pp. 147-152, and Tables 5 through 15, pp. 162-172. Data are presented in relation to: 1) the portion of the school year science is taught as a definite part of the curriculum at each grade level; 2) the extent that schools were departmentalized for science instruction; 3) the amount of time and number of periods allotted to science instruction; and 4) science class enrollments.

Portion of Year Science was Taught

Tables 5 through 11, pp. 162-168, show that overall, about half the schools or more devote more than half a year to science instruction as a definite part of the elementary school curriculum. At grade one and above more than 65 percent of all schools taught science as a definite part of the school curriculum for at least half a year. Overall, in relation to grade levels reporting, the percentage increased progressively by grade through grade six. For grades three and above, less than five percent of the schools offer no science at all.

Departmentalization for Science Instruction

Departmentalization for science instruction in one or more grades in each school was reported to vary from 27 percent in the state of the least reporting frequency for this practice to 75 percent in the state reporting the highest frequency. However, as shown in Table 12, p. 169, most of the occurrence is accounted for by grades four through six. In grades four through six, two states reported 50 percent or more departmentalization at the sixth grade level and only one state reported no departmentalization at any upper grade level. Overall, for the two regions, departmentalization in the upper grades ranged from 12.3 percent and 13.1 percent in grade four for Regions I and II, respectively, to 23.2 and 21.2 percent, respectively, for grade five and 34.6 and 24.2 percent, respectively, in grade six.

Less than 9.0 percent in any state reported this administrative practice in primary grades, and eight states reported absence of this practice in one or more primary grades.

Time and Number of Class Periods Allotted to Science Instruction

Data from classes reported as randomly selected by teacher respondents regarding the number of minutes per week and number of class periods per week allotted to science instruction are given in Tables 13 and 14, pp. 170-171. On a regional basis, approximately 63 percent in the Far West States and 83 percent in the Central States received science instruction three or more periods per week. Moreover, science instruction was offered for five periods per week in from 35.1 to 57.4 percent of the schools in each of the Central States, and varied from 5.9 to 50.0 percent of the schools in each of the Far West States.

The number of class periods devoted to science per week, variable 17, Table 3, p. 154, was shown to be significant based on school enrollment size. Collapsed data for expected values >5, $\chi^2_8 = 30.01$, $p < .001$. Among small schools there was a greater tendency for five periods of science instruction per week than in medium and large schools. There seemed to be no well defined tendency for other enrollment size groups.

The number of minutes per week the selected classes were given science instruction varied from 30 minutes to more than 240 minutes per week. A majority of the schools in each region, 57.9 percent in the Central States and 55.9 percent in the Far West reported devoting 90 minutes or more per week to science instruction.

Science Class Enrollments

Teacher respondents in the two regions reported, Table 15, that 39.3 percent of the selected science classes in the Central States and 54.1 percent of the classes in the Far West States had 30 or more students per class. Four states reported no selected class smaller than 20 or more students and in one state none of the selected classes were reported as less than 25 or more students.

Table 3, variable 16, number of students in the sampled class, $\chi^2_{15} = 91.3$. For collapsed data, expected value >5, $\chi^2_8 = 79.1$, $p < .001$. Examination of the data showed that for large enrollment size schools approximately 60 percent reported 30 students or more in the selected class. In small and very small schools, approximately 30 percent of the classes had over 30 students. However, caution is expressed in relation to interpretation of data for this variable. Obviously, a class size of over 30 students was highly improbable in very small schools. Similar factors would also apply to many schools in the small enrollment size category.

ELEMENTARY SCIENCE TEACHER CHARACTERISTICS

Data related to characteristics of the reporting teachers who taught science are given in Tables 16 through 28, pp. 173-185. Reference is also made in later sections of this chapter to patterns of science teaching, inservice education in science and other teacher-related variables. Data are presented in this section regarding: 1) percentage of male and female teachers; 2) age and teaching experience; and 3) academic background. It is to be noted that, overall, 98.6 percent of teacher respondents reported they were employed on a full time basis. Percents of full time respondents by state are given in Table 16, p. 173.

Sex of Science Teachers

Of those teachers who taught elementary school science 59.6 in Region I and 50.4 in Region II were female. It is to be noted that in some respects Table 16 shows a relatively high percentage of male teacher respondents. However, it is to be emphasized that approximately 68 percent of the teacher respondents were teachers in grades four or higher and that principals were instructed to randomly select one teacher from those teachers who taught science in the selected school. As a consequence, the percentages of male and female respondents seem compatible with generally known data.

Table 3, variable 1, shows that based on school enrollment size, $\chi^2_6 = 15.9$, $.025 > p > .01$. An examination of the data indicated that there was a tendency for medium size schools and large size schools to have a greater percentage of male teachers than very small and small schools.

Teacher Age and Teaching Experience

Reported teacher age is shown in Table 17, p. 174. Attention is directed to the large percentage of non-respondents on this item compared with most other items. The high percentage of non-respondents was believed to be attributable, in part, to the format of this item on the

Elementary Teacher Questionnaire, Appendix C, p. 269. Due to the location on the questionnaire page, the item could have been easily missed, especially by male respondents.

Of those reporting age, approximately 48 percent of the teacher respondents in Region I and 50 percent in Region II were 30 years of age or older. Respectively by regions those reporting an age of 50 years or more were 13.5 percent and 11.7 percent. In Region I 32.1 percent reported an age of under 30 years and in Region II 24.3 percent indicated under 30 years of age.

In comparison, Table 18, p. 175, indicates that 62.5 percent of the teacher respondents in Region I had less than 10 years elementary school teaching experience and 36.2 indicated less than five years elementary teaching experience. For Region II, 59 percent reported less than 10 years experience and 28.5 reported less than 5 years elementary experience. Further comparison with Table 19, p. 176, indicates that the years shown for experience in teaching elementary school science closely parallel the years of elementary school teaching experience given in Table 18.

However, Table 20, p. 177, shows a pattern that the teachers had had less experience within their present school systems. In Region I, 23.6 percent had 10 or more years teaching experience within the present system, whereas 37.0 percent reported 10 or more years of elementary teaching experience. For Region II, 26.8 percent reported 10 or more years in the present system and 41.0 percent reported 10 or more years of elementary teaching experience.

Overall, the vast majority, more than 80 percent in both regions, had no secondary school teaching experience as shown in Table 18, p. 175. Of those indicating some secondary school teaching experience, most of the respondents indicated less than five years.

Academic Background of Elementary Science Teachers

Data relative to academic degrees and undergraduate and graduate credit hours in science and science education are presented in Tables 21 through 28, pp. 178-185. In Region I, approximately 96 percent of the teacher respondents had a bachelor's degree; more than 25 percent had a master's degree and approximately 30 percent were enrolled in a degree program. In Region II, the respective responses were approximately 98 percent with a bachelor's, 23 percent with a master's and 19 percent enrolled in a degree program. In three states, all respondents had earned bachelor's degrees and in three states more than 30 percent had earned a master's degree. Respondents in four states reported doctor's degrees.

Table 3, p. 153, shows variable 2, $\chi^2_3 = 15.01$. Collapsed data for expected values >5 gave $\chi^2_2 = 14.4$, $p < .001$. Teachers who reported having earned a master's degree tended to teach in medium and large schools.

Reported data on undergraduate background in biological sciences, physical sciences, earth sciences, mathematics, science teaching methods and student teaching in science for the responding teachers is presented in Tables 22 through 27, pp. 179-184, respectively. In both regions, approximately 58 percent or more reported four or more semester credit hours of biological and physical science. In contrast, approximately 28 percent and 34 percent reported four or more credit hours of earth science and mathematics at the undergraduate level. Those reporting four or more credit hours in science teaching methods and student teaching in science were approximately 19 and 15 percent, respectively in Region I and 17 and 11 percent in Region II.

For background in biological sciences and physical sciences, variables 3 and 4, Table 3, $\chi^2_{12} = 23.57$ and 24.94, respectively. Data for variable 3, biological sciences, collapsed data for expected values >5, $\chi^2_8 = 14.34$, $.10 > p > .05$; and for variable 4, physical sciences, collapsed data for expected values >5, $\chi^2_8 = 21.80$, $.01 > p > .005$. In both cases, a tendency existed for teachers reporting 13 or more undergraduate credit hours to be associated with medium and large schools. This was particularly apparent in the case of physical science credit hours.

For graduate level credit hours, teacher responses are given in Table 28, p. 185. It is readily apparent in the sciences that a minimum of 70.5 percent do not report any graduate credit in the specific science areas shown. In Region I, approximately 90 percent report no graduate credit in three of the four areas. A comparison with science education credit hours, shows that 78.4 percent in Region I and 65.3 percent in Region II report no graduate credit hours in science teaching methods or science education.

Table 3, variable 5, background in graduate science education, gives $\chi^2_9 = 23.9$; collapsed data yield $\chi^2_4 = 16.10$, $.005 > p > .001$. Teachers reporting four or more graduate credit hours of science teaching methods or science education tended to be associated with medium and large schools.

ELEMENTARY SCIENCE MATERIALS, EQUIPMENT, SUPPLIES AND FACILITIES

Data related to elementary school science materials, science equipment, science supplies, and facilities for science instruction are given in Tables 29 through 48, pp. 186-205. Some of the data is interrelated with information on science course offerings and will be presented in the discussion of that topic. The present section presents data concerning science budgets, adequacy of science supplies and equipment, availability of certain types of special science facilities and audio visual aids; availability of certain types of classrooms for science instruction and the availability and usage of certain instructional materials such as textbooks and laboratory manuals.

Budgets for Science Equipment, Supplies and Facilities

Table 29, p. 186, presents a composite view of budgetary provisions for science instruction as reported by principals in the responding elementary schools. In both Region I and Region II, approximately 47 percent of the schools reported an annual budget for science equipment. In the case of science supplies, 51.4 percent in Region I and 64.3 percent in Region II reported an annual budget. It is also noted, however, that 75.6 percent of Region I respondents and 81.3 percent of Region II respondents indicated that teachers in that school were permitted to purchase equipment and supplies periodically throughout the year. It appears that some schools do not designate specific budgets for science equipment and/or supplies. Instead, these items are part of a general school budget for all curricular areas, or segments of elementary school areas.

Also shown in Table 29 was the reported use of NDEA funds for science equipment. A distinct difference is seen in the percentages reporting use of these funds for equipment in the two regions. In Region I, 66.2 percent reported use of NDEA funds for equipment, 47.8 percent of them having used these funds since September 1968. In contrast, 49.8 percent of the principals in Region II reported use of NDEA funds for equipment, 28.1 percent since September 1968. With increased percentages for those not reporting use of ESEA, a similar pattern is seen in both the use of ESEA funds for equipment and usage since 1968.

Although facilities will be referred to later, it is appropriate to note use of NDEA funds for facilities. In both cases, over 84 percent did not report use of the funds for science. Again, the percentage not reporting use of the funds is greater in Region II. It is of interest to note that in a companion secondary school science study by Chin (12) similar regional differences were found in the reported use of these two federal sources of funds for science instruction by the secondary schools in the same two regions.

Tables 30 through 33, pp. 187-190, present the levels of adequacy reported to have existed for supplies and equipment. Notice that Tables 30 through 32 are data obtained from principal respondents and those in Table 33 are obtained from teacher respondents. Comparing by regions, very little difference is seen in the percentages reported. Most values given are approximately ±2 percent for a particular category. For adequacy of supplies in Region I, 44.9 percent reported adequate at the kindergarten level; 51.0 percent reported adequate in grades one, two and three; and 51.0 percent reported adequate supplies in grades four, five and six. For Region II, these values are 41.9 adequate in kindergarten; 49.5 in grades one, two and three; and 50.7 in grades four, five and six. In both regions, the percentages which reported adequate supplies were lowest at the kindergarten level.

An examination of the data shows that at all grade levels more than 33 percent of the principals reported both equipment and supplies as inadequate or completely lacking. For regional data on equipment, Tables 30 through 32 show that the percentages reporting adequate equipment are all less than the percentages reporting adequate supplies, except in Region I, grades four, five and six, where reported percentages are approximately the same. For equipment there is an increment with each grade level group in the percentages reporting adequate. Combining the categories inadequate and completely lacking, it is seen that more than 33 percent reported inadequate or completely lacking at all levels and for both equipment and supplies.

The teacher respondent data, Table 33, shows that more than 47 percent of the science teachers reported that equipment and supplies for science demonstrations and experiments were inadequate or completely lacking. Comparison of Tables 30 through 33 shows a higher percentage of teachers than principals reported that equipment and supplies were inadequate or completely lacking.

Table 3, variable 13, $\chi^2_9 = 18.34$, $.05 > p > .025$. With collapsed data, expected value >5, $\chi^2_4 = 11.8$, $.025 > p > .01$. There appears to be a significant association of teachers who reported adequate equipment with medium size schools.

Availability of Special Science Facilities

Tables 34 and 35 report data on certain special science facilities and certain audio-visual aids available for science instruction. Comparison of the two tables shows that more than 75 percent of the schools, by region, reported that none of the selected special science facilities were available; whereas, the vast majority had most of the selected projectors, phonographs and recorders available.

However, in the case of opaque and microprojectors differences were noted. Variable 14, Table 3, $\chi_3^2 = 19.21$, $p < .001$. An association was indicated between the availability of an opaque projector and medium and large size schools. In the case of microprojectors, a much smaller percentage than the availability of other projectors was noted in both regions; however $\chi_3^2 = 21.04$, $p < .001$, and an association existed with large schools.

Types of Classrooms Available for Science Instruction

Principal and teacher respondent data for the type of classroom in which science was taught are given in Tables 36 through 39. Principals reported according to the type of classroom predominantly used for science at particular grade levels. These data are given in Tables 36 through 38, pp. 193-195. Teachers responded in terms of the type of classroom they generally used to teach science to the randomly selected science class. These data are given in Table 39, p. 196. For regional data, approximately 64 percent to 83 percent of the schools reported the use of regular classrooms with no special facilities for science, kindergarten through grade six. One exception, grade six, Region I, is noted. There, almost half, 49 percent, reported use of a classroom with no special facilities for science.

Teacher respondents indicated that classrooms with portable science kits or other special facilities were used in 61.2 percent of the selected classes in Region I and 72.5 percent in Region II.

Table 3, variable 19, $\chi^2_{12} = 29.72$, $.005 > p > .001$. A greater proportion of large size schools had special science rooms than did medium, small or very small schools.

Textbook Usage for Science Instruction

Data related to practices concerning adoption and usage of textbooks are given in Tables 40 through 44, pp. 197-201. Except for the kindergarten level, the most frequent practice reported for all grade levels, by regions, was the adoption of a single science textbook series. In Region I, from 48.6 percent to 64.2 percent reported adoption of a single text. In Region II, the percentages ranged from 44.0 to 50.9 percent. The next most frequent practice reported by principals was multiple textbooks used in grades one through six in Region II, and grades three through six in Region I. For kindergarten the most frequently reported practice, 34.5 percent, was no science textbook series adopted for Region I. For kindergarten in Region II, the most frequently reported practice, 29.3 percent, was adoption of a single textbook.

For both regions only about five to seven percent of the principals reported their schools did not adopt a science textbook series.

Teacher respondents also indicated a single textbook was frequently used with the selected class. In Region I 44.9 percent and in Region II 27.8 percent. Multiple textbooks were reported as 19.0 and 28.5 percent, respectively; single textbook including laboratory manual were 19.1 and 21.1 percent, respectively; multiple textbooks including laboratory manuals were 10.0 and 19.4 percent, respectively, and locally prepared materials were 24.7 and 35.5 percent in Regions I and II, respectively.

Although it must be realized that a teacher responding could correctly have indicated usage of more than one curriculum material type, combining all categories of textbook usage results in a realization that textbooks in various formats were extensively adopted for science instruction in both regions.

In Table 3, variables 20 and 21 show chi square values respectively of $\chi_6^2 = 21.50$ and $\chi_{15}^2 = 59.52$. Although caution is suggested due both to the percentage reporting and to the fact that respondents were given no directions to order or rank texts listed on the teacher questionnaire, some observations can be made about users who listed three or more curriculum materials. Those listing supplementary type materials tended to be associated with large schools; those listing basic texts as a third curriculum material used with the selected class appear to be associated with middle size schools; and those listing more recently published materials as a third curricular item are associated with medium and large schools.

SCIENCE COURSE OFFERINGS

In addition to textual curricular materials, the collected data included information on the use of science course improvement project materials. These materials are discussed in this section because their use generally involves instruction in the particular curriculum of the specific science course improvement project. The extent to which these materials were used in the selected science class was also surveyed, but is not reported in the present study.

Tables 44 through 49, pp. 201-206, present data relevant to the present study. Attention is also directed to Table 49 concerning teacher experience and training in science course improvement projects. The data are discussed by science course improvement project in the following order: SCIS, ESS, S-APA, and others.

Science Course Improvement Project (SCIS)

Overall, no more than 4.2 percent of the principals reported, Table 44, use of SCIS materials at any grade level in the two regions. The range was from 0.5 percent at the sixth grade level in Region I to 4.2 percent at the first grade level in Region II. The most prevalent usage was in the primary grades, which is consistent with the development of the SCIS program. The values presented in Table 48, p. 205, for teachers using SCIS materials with the selected class seem consistent with those given in Table 44.

Elementary Science Study (ESS)

Table 45 indicates that the highest percentage of usage was reported in Region I, with the highest percentages, 4.0 and 4.5, being indicated at grades four and five. In Region I there was also a grade by grade increment in percentage reported until grade six. Although with reduced percentages, the trend was apparent in Region II data. Again the pattern of teacher usage of ESS materials, Table 48, with the selected class appears consistent with the data reported by principals.

Science--A Process Approach (S-APA)

S-APA materials were the science course improvement project materials most frequently reported, overall, by regions, Table 46. The highest percentage, 11.3 percent, was reported at the kindergarten level. The next highest, 9.0 percent, was also in Region II at the third grade level. The lowest percentage reported was 2.9 at the sixth grade level in Region I. Generally, reports of S-APA materials usage were higher at each grade level in Region II. The Region II percentage was also higher, 7.2 percent as compared with 5.7 percent, for teacher respondents, Table 48.

Other Science Course Improvement Project Materials

Because of the overall low incidence of reporting, all other science course improvement projects were grouped to present a composite analysis of reported usage in Table 47. The percentages for Region I, except in kindergarten were approximately 3 or 4 percent and approximately 2 or 3 percent for Region II.

At this juncture it is relevant to note Table 49, which shows that for regional data, 87.4 percent in Region I and 84.6 percent in Region II of the teacher respondents did not report any teaching or workshop experience with science course improvement project materials.

PATTERNS OF SCIENCE TEACHING

Several types of data of interest are included in the present section of this chapter. Data from both principal and teacher respondents are included and are presented in Tables 50 through 68. Discussion is given in the following sub-sections: 1) patterns in curricular areas related to science instruction; 2) teaching roles for science instruction; and 3) learning activities.

Patterns in Curricular Areas Related to Science Instruction

Those data from the responding schools which relate to general aspects of the curriculum included in the survey are discussed here. The data assist in an examination of the relationship of selected aspects of the total school program to the science program. Discussion of significant differences associated with school enrollment size are not included in the present study.

Table 50 shows that the majority of schools, 40.9 percent in Region I and 44.0 percent in Region II, reported use of definite procedures for identifying children with special interests, aptitudes or talent in any curricular area in their school. However, in the area of science, it was found that 16.4 percent in Region I and 16.8 percent in Region II reported use of definite procedures for identifying children with special interest in science.

The relationship of the patterns of instruction in three curricular areas to science instruction were also surveyed: environmental and/or conservation education, health and narcotics or drug abuse education. Of particular interest is data related to environmental and/or conservation education, Tables 51 through 56. A large majority of schools in both regions, 79.9 and 88.5 percent, respectively, Table 51, reported that environmental and/or conservation science was taught. The availability of facilities such as outdoor education laboratories, school farms or school forests was reported by 42.5 percent in Region I and 48.6 percent in Region II.

Tables 52 through 57 present findings on the teaching patterns reported for environmental and/or conservation education, kindergarten through grade six. The highest percentages, approximately 30 to 40 percent were reported for the pattern of teaching environmental and/or conservation science with elementary school science. The next most frequent pattern, approximately 20 to 29 percent reported, was teaching environmental and/or conservation science with two or more subjects including science in kindergarten through grade six. It should be noted, Tables 52 and 56, that small percentages, approximately 2 to 7 percent, reported teaching environmental and/or conservation science as a separate subject and less than one percent reported teaching environmental and/or conservation science with two or more subjects excluding science.

In the case of health, taught with elementary school science, Table 57, the practice was more frequently reported in Region I than in Region II for all grades. Although less frequently reported in kindergarten, the range for grades one through six was relatively small, 33.7 percent to 37.7 percent in Region I and 19.4 percent to 22.6 percent in Region II.

Table 58 shows reported percentages for schools indicating that narcotics or drug abuse education was taught with science. The ranges for Region I were 6.3 to 19.2 percent, with increments from kindergarten through grade six. The reported percentages were somewhat less in Region II with a range from 5.5 percent in kindergarten to 15.7 percent in grade six.

Teaching Roles for Science Instruction

Data were obtained from principals' questionnaires on who teaches science to children at each grade level. Seven major teacher roles were identified. Reported percentages for each of these patterns are given in Tables 59 through 65. Table 66 shows which of these patterns was reported by the teacher respondent as her role with the selected class. By considerable amounts, the highest percentages of principal respondents reported that elementary school science was generally taught by a classroom teacher with no help from an elementary science specialist or consultant, Table 59. This was the pattern for both regions. Reported percentages were also highest in the primary grades for both regions. Table 66 indicates comparable findings among the teacher respondents. In Region I, 55.1 percent and in Region II 56.8 percent indicated that their role with the selected class was that of a classroom teacher with no help from an elementary science specialist or consultant.

Table 66 also shows that the next highest percentages for teacher respondents, 16.3 percent for Region I and 14.9 percent for Region II was for the pattern in which a regular classroom teacher taught science for other teachers. As would be anticipated, since both the principal and teacher respondents were located in the same school, Table 60 shows this role to be the one with the next highest percentages reported by principals for the fifth and sixth grade levels. Principals reported the practice much less frequently for kindergarten through grade six.

Special science teachers on the school staff, Tables 61 and 66, were also more frequently reported at the upper grade levels. Of the teacher respondents, approximately 10 percent in both regions indicated they were special science teachers on the school staff.

Tables 63 and 66 show that relatively few principal and teacher respondents, approximately 3 to 6 percent and 1 to 2 percent, respectively by regions, reported that science was taught by a classroom teacher with help of an elementary science specialist or consultant on the school staff. However, Tables 64 and 66 show that this pattern of help of an elementary science specialist or consultant from the central office staff was more frequently reported, approximately 8 percent in both regions for teacher respondents. Principals in Region I reported the practice ranging from approximately 8 to 11 percent for kindergarten through grade six; for Region II, approximately 11 to 13 percent.

For the responding teachers' role in the sampled class, variable 18, Table 3, $\chi^2_{24} = 57.1$. For collapsed data, expected value >5, $\chi^2_8 = 37.5$, $p < .001$. A greater proportion of small and very small schools than medium schools had teachers who taught science with no help from an elementary science specialist or consultant. Also, a greater proportion of large schools than medium, small or very small enrollment size schools had teacher respondents who reported their role was a special science teacher on the school staff.

Educational television was reported, Table 65, by Region I principals as varying in availability from approximately 16 to 25 percent from kindergarten through grade six. Region II principals reported educational television availability as varying from approximately 26 through 40 percent from the kindergarten level through grade six. However, Table 66 shows the percentage of teacher respondents indicating that they were classroom teachers who coordinated science instruction with educational television was much less and approximately the same in both regions, 4.1 percent and 4.7 percent, respectively. It is probable that principal respondents were simply indicating that various types of science television programs were available.

Table 67 shows that the most prevalent practice reported by teacher respondents was teaching science as a separate subject. In Region I 55.1 percent and in Region II 48.4 percent reported the practice. By regions, approximately equal percentages, 23.1 and 24.6, reported the separate and incidental pattern and similarly 8.2 and 7.0 percent for the integrated and incidental pattern. For those reporting that science instruction for the selected class was integrated with another subject the percentages were 8.1 in Region I and 12.4 in Region II.

Learning Activities

Teacher respondents were asked to rank the three learning activities that they used most often with the selected science class and to indicate all other activities used. Table 68 indicates by region the percentages of teacher respondents which assigned each rank to the activities. Clearly, lecture-discussion was the most frequently used activity. In Region I 54.9 and in Region II 44.4 percent ranked lecture-discussion as the most often used activity. If all responses for this item are combined, it can be seen that 80.8 percent in Region I and 79.3 percent in Region II reported use of lecture-discussion as a learning activity with the selected science class.

Science demonstrations were ranked as most often used activity the second highest percentage of times and were most frequently reported as the second most used activity. In Region I, 11.4 percent and 31.9 percent ranked science demonstrations as most often used and second most used, respectively; for Region II the percentages were 12.4 and 22.3, respectively.

All activities were reported used to some extent. However, it appears that auto-tutorial and programmed instruction activities were very infrequently used.

CONSULTANT SERVICES AND INSERVICE EDUCATION

Data related to several categories of consultant services and inservice education are included in this section. Percentages of principal responses concerning availability and usage of various types of consultant services and inservice education activities are discussed. Teacher responses concerning their reported use of the inservice education opportunities are also discussed. This section is divided into two sub-sections: 1) Consultant Services, and 2) Inservice Education. The data are presented in Tables 69 through 88, pp. 227-246. Attention is also directed to the sub-section, Teaching Roles for Science Instruction, pp. 113-117, and Tables 59-66 for related information on consultant services.

Consultant Services

Principals in both regions reported, Table 69, that consultant or supervisory help was available in about half the schools; slightly less for Region I, 50.6 percent reported, than for Region II, 55.3 percent reported. Of the six categories given for consultant service types, the most frequently reported, Table 70, for both regions was an elementary science consultant, supervisor or specialist. This type of help was reported by 15.3 percent and 18.2

percent of the Region I and Region II principals, respectively. Approximately equal percentages, 13.5 percent and 13.1 percent respectively, reported availability of a general elementary supervisor with only general knowledge of science. Some differences between regions were reported for two other categories, availability of a classroom teacher with special training or competence in science and availability of a high school science teacher. Region II reported more occurrence, 12.9 percent compared to 9.9 percent for the former practice; and Region I reported more occurrence, 12.4 percent compared to 8.5 percent, of the latter practice. It is to be noted that principals were able to indicate availability of more than one type of service. Consequently, the total percentages reported in Table 70 will exceed those given in Table 69.

Tables 71 through 77 indicate the extent to which principals reported utilization of all types of consultant services by teachers at each grade level in their school.

Overall, in both Region I and Region II, consultant services were rarely or never used in a majority of the schools reporting at all grade levels. Relatively small percentages, about equal in both regions, reported even occasional usage of consultant help. These data are generally supported by Tables 78-87 which show reported percentages of frequency of use of the various service types by grade level groups. However, the very often categories in Table 81 for providing materials seem higher than the previous Tables would indicate they should be.

Inservice Education

Principal data concerning availability of opportunities for science inservice education are given in Table 87. Percentages of responses of teacher participation in science inservice education opportunities since September, 1968 are presented in Table 88. Immediately apparent is that at their highest level, teacher participation percentages are less than half of the reported availability and for some categories it is less than one-fourth of the availability percentages. For example, the most frequently available and used were teachers' meetings. In Region I 79.6 percent and in Region II 75.6 percent of the principals reported that teachers' meetings on science education were available. However, only 35 percent in Region I and 30.8 percent in Region II of the teachers reported participating in teachers' meetings on science since 1968. This was also about the same for elementary science workshops. For elementary science courses a greater disparity can be seen. Availability was reported by 61.7 percent and 80.2 percent of the principals in Regions I and II, respectively.

Teacher usage was 13.0 percent and 20.1 percent respectively. Availability and usage of elementary science courses, elementary science workshops and science television and radio programs were greater in Region II than in Region I.

Table 3 shows that variables 6 to 12 were associated with school size. All of these were associated with medium and large enrollment size schools. For collapsed data, expected values >5 the following were obtained: variable 6, $\chi^2_4 = 10.9$, $.05 > p > .025$; variable 7, $\chi^2_4 = 8.9$, $.10 > p > .05$; variable 8, $\chi^2_4 = 9.1$, $.10 > p > .05$; variable 9, $\chi^2_4 = 11.8$, $.025 > p > .01$; variable 10, $\chi^2_4 = 9.8$, $.05 > p > .025$; variable 11, $\chi^2_4 = 9.21$, $.10 > p > .05$; variable 12, $\chi^2_4 = 12.9$, $.025 > p > .01$. Of these, the following were significant at the .05 level: teachers' meetings, elementary science workshops, visitations and demonstration teaching, and other inservice science education programs.

BARRIERS TO EFFECTIVE SCIENCE TEACHING

Teacher respondents were asked to indicate the degree of difficulty which certain factors offered to effective science teaching in their school. Table 89 presents the percentages indicating each level of difficulty for the factors given. It is apparent that for all but four of the factors in both regions, approximately 50 percent or more of the teachers reported that these factors offered some or great difficulty to effective science teaching. Further, several factors were reported as offering great difficulty to effective science teaching by about 20 to 29 percent of the teacher respondents. For Regions I and II respectively, these percentages for great difficulty were: inadequate room facilities, 23.0 and 22.1; insufficient funds for purchasing needed supplies, equipment and appropriate reading materials, 26.2 and 29.0; lack of adequate consultant services, 26.6 and 29.0; and lack of inservice opportunities, 23.3 and 21.1. In Region II, for great difficulty, teachers do not have sufficient science knowledge, 19.9 percent, and not enough time to teach science, 24.6 percent, also fit into that range.

TEACHER SATISFACTION WITH TEACHING ELEMENTARY SCHOOL SCIENCE

Table 90 shows the percentages of teachers reporting certain degrees of satisfaction with teaching elementary school science. It can be seen that 41.3 percent of the Region I teacher respondents reported they were very dissatisfied, dissatisfied or neutral about teaching elementary school science. For Region II, the percentage was 47.2 of the teachers. Those reporting satisfied or very satisfied in Regions I and II respectively were 58.3 and

52.9 percent.

SUMMARY

Areas listed on p. 89 were analyzed in this chapter. Differences between regions, states and school enrollment size groups were found. An analysis of results of the status survey regarding the nature of elementary school science in eleven states within two geographic regions has shown that diversity exists for a large number of variables examined in relation to the problems and subproblems of the study. Conclusions based on analysis of these data and recommendations are given in Chapter V.

CHAPTER V

SUMMARY AND CONCLUSIONS

INTRODUCTION

In this chapter the study is summarized, and conclusions from major findings of the study are stated. Due to the large number of variables reported in the study, the quantity of tabular data presented and the number of results of the study, no attempt is made in this chapter to comprehensively reiterate material presented in the previous chapter. Only outcomes of the study considered by the investigator to be of particular educational or statistical significance will be discussed here. For greater detail on specific results of the study, the reader is referred to Chapter IV. Recommendations are presented in Appendix E, p. 282.

SUMMARY

The major problem of the study was to obtain information about the science teaching practices, procedures, policies and conditions prevailing during the 1970-1971 school year in the public elementary schools in two geographic regions of the United States. Sixteen sub-problems related to elementary school science programs, science budgets, science faculty, instructional procedures in science and science facilities were investigated.

The design of the study included a three stage sampling procedure to randomly select a sample of over 3,000 elementary schools in the eleven states of the two geographic regions. Two structured questionnaires were sent to principals of the randomly selected schools. Principals randomly selected one of the teachers who taught science in their school to receive the teacher questionnaire. One science class was randomly selected by the teachers to obtain certain data for the teacher questionnaire. Determination of responding and non-responding schools was made. Follow-up was conducted.

Analysis of the data was conducted by standard computer programs. Much of the data output consisted of descriptive statistics. Chi square analysis was made where appropriate. The regional and large state sample sizes were determined to be adequate. No inferences about causal relationships were made.

No generalizations are intended beyond those that can be stated relative to the principal and teacher respondents from the sample.

CONCLUSIONS

Outcomes which the investigator considered to be major are included here. Numerous other findings were made and are reported in Chapter IV. Conclusions in this chapter are organized under the following sections: 1) Conclusions Related to School Geographical Location, 2) Conclusions Related to School Enrollment Size, and 3) Conclusions Related to Trends in Elementary School Science. Major findings in each of these chapter sections are discussed in the following subsections: teacher preparation, elementary school science practices and funding for elementary school science.

CONCLUSIONS RELATED TO SCHOOL GEOGRAPHICAL LOCATION

This section presents major findings in the areas of teacher preparation, elementary school science practices and funding for elementary school science as they related to the geographical location of the schools from which principal and teacher questionnaires were received. For purposes of the study, schools were grouped into two geographical regions: Region I, the Central States, and Region II, the Far West States. Schools in the states of Illinois, Indiana, Michigan, Ohio and Wisconsin comprised the Central Region and schools in Alaska, California, Hawaii, Nevada, Oregon and Washington comprised the Far West Region. Great similarities were found in the data from schools in the respective regions and states. Certain significant differences were also found. Both significant differences and similarities are discussed below.

Teacher Preparation

Similarities and differences in teacher preparation at the undergraduate level, graduate level and inservice education levels are presented as they related to regional findings and to state findings.

Regional Similarities and Differences in Teacher Preparation

The following similarities in Regional data were found for the undergraduate level science preparation of the elementary teachers who taught science:

1. Overall, teacher preparation in terms of undergraduate semester hours in the sciences was low for both regions.
2. In the biological sciences, over 50 percent of the respondents in both regions reported six semester credit hours or less.
3. Preparation in other science areas was even lower than in the biological sciences.
4. Over 70 percent reported six credit hours or less in physical sciences.
5. Over 70 percent of the teachers in both regions reported less than four hours credit in earth science.
6. Six hours or less in mathematics was reported by more than 65 percent of the teachers in both regions.

7. Over 80 percent reported three hours or less in science teaching methods.
8. About 35 percent or more reported no credit hours in science teaching methods.

Regional similarities were also found in regard to graduate preparation. It should be recalled that for analysis in the present study a criterion of only one or more semester hours credit was used. The regional similarities in graduate preparation in science and science education were the following:

1. Graduate level preparation in the sciences as shown by reported semester hours credit in the sciences was very low.
2. At least 80 percent of the respondents in both regions reported no graduate hours in biological sciences.
3. At least 85 percent reported no graduate physical science or no earth science.
4. More than 70 percent reported no graduate preparations in mathematics.
5. Approximately two-thirds reported no graduate level courses in science education or science teaching methods.

The following regional similarities were found regarding the academic degrees reported by teacher respondents:

1. Almost all of the teachers in both regions had completed a bachelor's degree.
2. About half of the respondents had completed or were enrolled in a graduate degree program.

Regional similarities were also found for teacher preparation in relation to science course improvement projects. Almost 90 percent of the teacher respondents did not report attendance at a workshop or institute on science course improvement projects.

To summarize regional similarities, the level of undergraduate, graduate and science course improvement project preparation was low in both regions. This was especially true in the science teaching methods, earth science and science course improvement project areas.

Within this overall pattern of low preparation, some differences were found between the respondents of the two regions. Of interest were the following differences:

1. Graduate preparation in all science and science education areas was lowest in the Central States.
2. Less than half as many Central States as Far West States teachers reported graduate work in biological sciences.
3. About two-thirds as many Central States teachers as

Far West teachers reported graduate hours in physical sciences, earth sciences, mathematics and science education.

Some regional differences were found in the preparation of responding elementary teachers who taught science as shown by participation in science inservice education activities. Of interest were the following differences:

1. Participation in Elementary Science Courses and Elementary Science Workshops was highest in the Far West Region.
2. The most frequently reported science inservice education in the Central States was teachers' meetings.

For regional data, it can be concluded from the above that major findings of the study were related to academic preparation in science and science education of the teachers who taught elementary school science. It is apparent that almost all of the teacher respondents in both regions had completed a bachelor's degree and about half had completed or were enrolled in a graduate degree program. However, the overall level of preparation in the sciences and science education was low. In both regions, at least half the teachers had the equivalent of two courses or less in biological sciences. For other content areas the preparation level was less. Most important, science education was found to be an area of particular weakness. More than one-third of the respondents reported no credit hours in science teaching methods.

State Similarities and Differences in Teacher Preparation

The overwhelming pattern of similarity shown in teacher preparation in the two regions was repeated among the states. The overall preparation in the sciences and science education was low. The reader is reminded of the cautions given in Chapter IV concerning interpretation of the data from respondents in the individual states. As a consequence the differences are only reported in terms of the larger states, California, Illinois, Indiana, Michigan, Ohio, Oregon, Washington and Wisconsin.

The overall pattern of similarity previously reported in Chapter V continued in the states; however, the following differences were noted:

1. A higher percentage of teachers in the individual states of the Far West Region than of the Central Region reported one or more graduate credit hours in science and/or science education.
2. The individual states, Indiana and Ohio respectively, reporting the highest and lowest percentage of teachers

with masters degrees, were both in the Central States.

3. Oregon teacher respondents reported the highest level of participation in workshops or institutes on science course improvement projects.
4. California reported the least participation in workshops or institutes on science course improvement projects.

Summary of Geographical Similarities and Differences In Teacher Education

To summarize findings on teacher preparation related to regional and state data, the most significant finding was the similarity in the different geographical areas. A few differences were found. However, it seems to be clearly shown that the general level of preparation in science and science education was low. Reinforcement of this conclusion is found in the fact that teachers in both regions strongly indicated that both lack of science knowledge and lack of science methods were barriers to effective science teaching. When the real percentages of teacher responses are considered the actual differences between regions and/or states is very little.

Elementary School Science Practices

Geographical similarities and differences in elementary school science practices were also found. These are discussed below in relation to school organizational practices, practices for science instruction, and practices regarding facilities for science.

Geographical Similarities in School Organizational Practices

The two regions reported generally similar administrative and organizational practices for science instruction. Among these were the following:

1. Science was taught as a definite part of the curriculum for more than half of the school year in most of the schools of both regions.
2. Departmentalization for science instruction was reported more frequently for grades four, five and six than for the lower grades in both regions.
3. At least two-thirds of the schools taught science three or more periods per week to the selected science class.
4. More than three fourths of the schools reported enrollment sizes of 25 or more students in the selected science classes.

Geographical Similarities in Practices for Science Instruction

Similarities in the two regions were also found in regard to various aspects of science instruction. Of interest among the findings were the following:

1. The use of science course improvement materials in both regions was low.
2. A single science textbook series was the most commonly used curriculum material in both regions.
3. Lecture-discussion was the most commonly used learning activity in the selected science classes.
4. About half of the teacher respondents in both regions indicated that science was taught as a separate subject.
5. The most common pattern of science teaching in both regions was science taught by a regular classroom teacher with no help from an elementary science specialist or consultant.

Geographical Similarities in Facilities for Science Instruction

Patterns of regional similarity were also apparent in facilities provided for science instruction. Among these were the following:

1. Principal respondents of both regions reported that in over two thirds of the schools science was generally taught at most grade levels in a regular classroom with no special facilities for science instruction.
2. Principals of both regions reported that a special room for science instruction was more generally

available at grades four, five and six than at lower grade levels.

3. More than 60 percent of the teacher respondents in both regions taught science to the selected class in a regular classroom with some portable science kits or science materials available.

To summarize, considerable similarities were found in the elementary school science teaching practices in the two geographical regions. The use of science curriculum improvement project materials was small. The use of a single science textbook series was high. Lecture-discussion was the most used learning activity. The incidence of special facilities for science instruction was low.

Geographical Differences in Science Teaching Practices

However, some geographical differences in elementary school science practices were found. Since the occurrence of significant differences was low, the differences are grouped together. The differences of interest to the present study were the following:

1. At the sixth grade level, departmentalization for science was more frequently reported in Region I,

the Central States, than in Region II, the Far West States.

2. In Region I a larger percentage of the teacher respondents reported selected science classes with less than 30 students enrolled.
3. Science course improvement project (SCIP) materials were more frequently reported in use in Region II.
4. Region I schools reported more frequent use of a single science textbook series for upper grade science instruction.
5. Among the larger states, Oregon and Washington schools were the least reported users of single science textbook series.
6. Special science facilities were more frequently used with selected science classes in Region I than in Region II.

Summary of Geographical Similarities and Differences In Elementary School Science Teaching Practices

In both regions there was an overwhelming use of textbooks as the predominant curriculum material for science instruction and a predominance of lecture-discussion as the most used learning activity. Such emphasis on textbook usage and lecture-discussion methods results in caution concerning interpretation of data in Chapter IV regarding use and availability of science equipment, supplies and facilities. A comparatively small percentage of teachers considered lack of supplies and equipment as a barrier to effective science teaching. These data were generally supported by adequacy levels stated by principals, but lower percentages of the teachers expressed that supplies and equipment were adequate. The very firm establishment of science textbook reading and discussion would undoubtedly preclude strong expressions of need for special facilities, equipment and supplies in elementary school science. These conditions would also tend to make comparisons with earlier studies and assessment of the use of NDEA and ESEA funds for elementary school science difficult.

It was also seen that in the case of regional differences, that the incidence of smaller selected science class sizes and availability of special science facilities was higher in Region I. However, the incidence of the use of science course improvement project materials was less in Region I.

Funding for Elementary School Science

A significant regional difference was noted in the use of National Defense Education Act and Elementary and Secondary Education Act funds for science equipment.

Region I reported a much higher utilization of these federal funds for science. Both regions, nevertheless, reported about equal existence of annual equipment budgets for science. This latter implies similar importance attached to science if the fact that a budget has been designated for science can be used as a criterion. It was also found that higher percentages were reported in Region II for the categories completely lacking and inadequate regarding the adequacy of equipment. Apparently, the need for additional equipment was recognized; but, for some reason(s) not surveyed in the present study, the level of use of federal funds was lower in Region II. It [illegible] possible that federal and/or state policies regarding implementation of NDEA and ESEA programs have resulted in the differences found.

In this regard, it is also of interest to note that although there were generally similar percentages reported in the two regions for the degree of satisfaction with teaching elementary school, at the very satisfied with teaching elementary school science level, Region I percentages were again higher than Region II. It seems likely that funding would have a strong relationship with the lower Region II responses.

In Region II, as discussed above, there were also fewer percentages of teacher respondents reporting student enrollment sizes in the selected science class to be under 30 students per class. Again, it would seem appropriate to conclude that these results are a function of funding and also have a bearing on teacher satisfaction.

SCHOOL ENROLLMENT SIZE

Four categories of school enrollment size were used in the analysis. Very small schools had less than 40 students enrolled; small schools had 40 to 399 students; medium enrollment size schools had 400 to 799 students; and schools with enrollments of 800 or more were classified as large elementary schools. Conclusions related to school enrollment size were made regarding teacher preparation, elementary school science practices and funding for elementary school science. In general very few significant differences were noted. Differences of particular interest are given below. For a comprehensive view of similarities the reader is referred to Chapter IV.

Teacher Preparation

Better prepared teacher respondents were found to be associated with larger enrollment size schools. For undergraduate backgrounds in biological sciences and, particularly, physical sciences, teachers reporting at least 13 semester credit hours were associated with medium and large enrollment size schools when compared with very small and small enrollment size schools.

For graduate work, teachers reporting master's degrees were associated with medium and large enrollment size schools. This was also the case for teachers who reported four or more graduate semester credit hours in science teaching methods or science education.

Elementary School Science Practices

Large enrollment size schools were associated with the availability of special science rooms. However, no association was found for departmentalization with school enrollment size and no association was found with use of science course improvement projects. Thus it seems that the availability of special science rooms or laboratories is not related to either the administrative organization pattern for science or with specific science course offerings in these schools.

Funding for Elementary School Science

Several interesting aspects about school funding related to school enrollment size can be inferred from the data. Teacher respondents who taught elementary school science with no help from elementary science specialists or consultants were associated with small schools. It can be inferred that funding has not been allocated in small schools for these services.

Availability of special science rooms and facilities were associated with larger enrollment size schools as was the reported adequacy of science equipment. Both of these would require allocation of funds for the science program. It is important to note that the use of National Defense Education Act (NDEA) and Elementary and Secondary Education Act (ESEA) funds for science was not associated with school enrollment size.

Three characteristics of teacher respondents associated with school enrollment size also relate to funding. Teachers who reported higher levels of academic preparation, as discussed above, were associated with larger schools as were male respondents and respondents who had the role of special science teacher. It can be inferred that the existence of teachers with these characteristics would indicate higher salaries in the larger schools.

TRENDS

Certain trends were identified by comparison of the conclusions of the present study with conclusions from earlier studies discussed in Chapter II. Trends are presented below in relation to teacher preparation and elementary school science practices. No trends in funding were identified.

Teacher Preparation

Analysis of findings of the present study showed that almost all of the teacher respondents had completed baccalaureate degrees and about half were working toward or had completed an advanced degree. Thus, the percentages having completed undergraduate and graduate degrees was significantly higher than for respondents in studies conducted during the previous decade or earlier as reviewed in Chapter II. The trend toward more teachers having completed degrees with the passage of time, reported by Snoble (42) seems to have been verified in the regions studied.

Also confirmed were findings, such as those by Challand (11), that undergraduate backgrounds of teachers in terms of credit hours were generally greatest in the biological sciences. It may also be inferred that a percentage somewhat higher than the five percent found by Auletto (3) would have sufficient credit hours in biological science to constitute a major or minor.

Undergraduate physical science backgrounds also seem to have improved since previous studies. However, earth scheice continues to be lacking in the academic background of about half the teachers. An important area of weakness was preparation in science education as shown by semester credit hours. More than one-third of the teacher respondents reported no credit hours in any type of elementary school science teaching methods. These findings were in contrast to Ricker (38), who indicated better backgrounds in science methods in Maryland.

Significantly, over two-thirds of both regions felt that both lack of science knowledge and science methods were barriers to effective science teaching. These findings do not demonstrate a major change from findings by previous investigators such as Blackwood (5), Piltz (35) and Dillon (14). It would seem that much still needs to be done to help teachers gain confidence and feelings of adequacy about teaching elementary school science. The present lack of credit shown in graduate science and science education and workshop experience with science course improvement projects dramatizes the needs.

However, for other inservice education activities, a slightly better outlook can be concluded. Availability of inservice activities seems to have increased; but, additional teacher participation in these activities seems to continue to be needed.

Elementary School Science Practices

Several practices reported by Blackwood (5) and other earlier studies were confirmed by the present study. The most obvious was the continued use of textbooks as the predominant instructional material. Concurrently, the trend toward predominance of lecture-discussion for science learning was continued.

The data would also seem to still support the conclusions of Snoble (42) that the firm establishment of textbook reading and lecture-discussion makes very unlikely a strong expression of need for the special science facilities, equipment, and supplies that are a part of student activity approaches.

Practices regarding the patterns of science teaching show a decrease from those reported by Blackwood (5) in the percentage reporting classroom teachers with no help from an elementary consultant or science specialist, although this is still the predominant practice. This is apparently due both to an increase in the availability of consultant services and to an increase in special science teachers. In regard to consultant services, however, it should be noted that the frequency of usage of each category of help was considerably less than the overall availability.

The teaching of science as a separate subject as the major pattern reported by teachers tends to remain basically unchanged from Blackwood's study (5). Environmental and/or conservation education appears to be considered an integral part of elementary school science rather than a separate subject to be taught or integrated.

APPENDIX A

DATA TABLES FOR STATES AND REGIONS

TABLE 1

NUMBER OF SCHOOLS IN SAMPLE AND NUMBER AND PERCENT OF RETURNED QUESTIONNAIRES FROM SCHOOLS AND NUMBER OF RETURNED QUESTIONNAIRES AND NUMBER OF USABLE QUESTIONNAIRES FROM PRINCIPALS AND TEACHERS IN THOSE SCHOOLS BY STATE AND REGION

State & Region	Sample Size	Number of Schools Represented by Returns	Number of Principals' Questionnaires		Number of Teachers' Questionnaires		Percent Return Schools
			Returned	Usable	Returned	Usable	
Illinois	509	178	170	165	158	158	34.9
Indiana	232	98	92	91	91	91	42.2
Michigan	429	153	146	145	131	131	35.7
Ohio	603	301	287	276	275	275	49.9
Wisconsin	191	77	74	74	69	68	40.3
Alaska	17	6	4	4	5	5	35.3
California	1025	294	278	278	260	260	28.7
Hawaii	38	18	16	16	17	17	47.4
Nevada	26	11	11	11	10	10	42.3
Oregon	112	52	51	51	42	42	46.4
Washington	160	78	75	74	70	69	48.8
Region I	1964	807	769	751	724	723	41.1
Region II	1378	459	435	434	404	403	33.3
Regions I & II	3342	1266	1204	1185	1128	1126	37.9

TABLE 2
CHI SQUARE VALUES FOR PRINCIPAL RESPONDENT VARIABLES ASSOCIATED AND NOT ASSOCIATED WITH SCHOOL ENROLLMENT SIZE FROM DATA OF ONE SELECTED STATE IN EACH GEOGRAPHIC REGION

Variable Name		Indiana			Oregon	
	N^a	d.f.^{b}	χ^{2b}	N^a	d.f.^{b}	χ^{2b}
1. Extent of school year science is taught Kindergarten	54	9	6.80	9	9	0.00
2. " Grade 1	71	9	5.25	31	9	2.28
3. " Grade 2	71	9	3.98	31	9	2.00
4. " Grade 3	71	9	4.60	32	9	2.13
5. " Grade 4	70	9	8.58	28	9	2.49
6. " Crade 5	67	9	12.98	29	9	1.11
7. " Grade 6	59	9	13.36	28	9	13.48
8. School departmentalized for science	75	3	4.27	37	3	2.55
9. Grades science departmentalized Kindergarten	32	3	0.00	17	3	0.00
10. " Grade 1	32	3	0.00	17	3	0.00
11. " Grade 2	32	3	0.00	17	3	0.00
12. " Grade 3	32	3	0.00	17	3	7.97
13. " Grade 4	32	3	5.51	17	3	0.78
14. " Grade 5	32	3	4.32	17	3	0.72
15. " Grade 6	32	3	2.07	17	3	0.35
Prevailing science teacher role						
16. Regular classroom teacher with no help Kindergarten	76	3	0.09	37	3	1.76
17. " Grade 1	76	3	0.41	37	3	1.51
18. " Grade 2	76	3	0.02	37	3	1.26
19. " Grade 3	76	3	0.62	37	3	1.26
20. " Grade 4	76	3	1.29	37	3	1.78
21. " Grade 5	76	3	2.77	37	3	0.93
22. " Grade 6	76	3	0.92	37	3	2.00
23. Regular classroom teacher who teaches science classes for other teachers Kindergarten	76	3	0.00	37	3	0.00
24. " Grade 1	76	3	0.00	37	3	0.00
25. " Grade 2	76	3	0.00	37	3	0.00
26. " Crade 3	76	3	1.84	37	3	0.00
27. " Grade 4	76	3	2.98	37	3	2.78
28. " Grade 5	76	3	2.20	37	3	2.54
29. " Grade 6	76	3	0.74	37	3	2.54
30. Special science teacher on school staff Kindergarten	76	3	0.00	37	3	0.00
31. " Grade 1	76	3	0.00	37	3	0.00
32. " Grade 2	76	3	0.00	37	3	1.35
33. " Grade 3	76	3	0.00	37	3	1.35
34. " Grade 4	76	3	1.95	37	3	1.35
35. " Grade 5	76	3	3.43	37	3	1.35
36. " Grade 6	76	3	5.36	37	3	1.35
37. Special science teacher from central office staff Kindergarten	76	3	0.00	37	3	0.00
38. " Grade 1	76	3	6.69	37	3	0.00
39. " Grade 2	76	3	6.69	37	3	0.00
40. " Grade 3	76	3	6.69	37	3	0.00
41. " Grade 4	76	3	6.69	37	3	0.00
42. " Grade 5	76	3	6.69	37	3	0.00
43. " Grade 6	76	3	6.69	37	3	0.00

TABLE 2, cont.

Variable Name		Indiana			Oregon	
	N^a	d.f.^{b}	χ^{2b}	N^a	d.f.^{b}	χ^{2b}
44. Classroom teacher with help of elementary science specialist or consultant on school staff Kindergarten	75	3	0.58	37	3	1.35
45. " Grade 1	75	3	0.58	37	3	1.93
46. " Grade 2	75	3	0.58	37	3	3.25
47. " Grade 3	75	3	0.58	37	3	3.25
48. " Grade 4	75	3	0.58	37	3	7.59
49. " Grade 5	75	3	2.00	37	3	5.89
50. " Grade 6	75	3	0.00	37	3	5.89
51. Classroom teacher with help of elementary science specialist or consultant on central office staff Kindergarten	75	3	2.22	37	3	0.19
52. " Grade 1	75	3	0.65	37	3	1.35
53. " Grade 2	75	3	0.65	37	3	1.35
54. " Grade 3	75	3	0.65	37	3	1.35
55. " Grade 4	75	3	2.45	37	3	1.35
56. " Grade 5	75	3	3.04	37	3	2.36
57. " Grade 6	75	3	3.04	37	3	2.36
58. Educational television science programs available Kindergarten	75	3	1.19	37	3	3.79
59. " Grade 1	75	3	0.01	37	3	4.64
60. " Grade 2	75	3	0.01	37	3	5.68
61. " Grade 3	75	3	0.11	37	3	7.50
62. " Grade 4	75	3	0.41	37	3	8.35
63. " Grade 5	75	3	0.20	37	3	5.34
64. " Grade 6	75	3	0.79	37	3	5.34
65. Budget for science equipment	74	12	3.29	36	12	8.53
66. Budget for science supplies	73	12	13.63	34	12	5.56
67. Teachers permitted to purchase science supplies & equipment	74	3	3.07	35	3	4.78
68. NDEA funds used to remodel science facilities	74	6	9.48	37	6	1.35
69. NDEA funds used to purchase science equipment since 1968	75	6	3.67	36	6	6.32
70. ESEA money used to purchase science equipment since 1968	71	6	2.85	35	6	4.31
71. Adequacy of science supplies Kindergarten	56	9	1.43	15	9	7.00
72. " Grades 1-3	70	9	0.85	34	9	4.26
73. " Grades 4-6	66	9	0.41	33	9	1.31
74. Adequacy of science equipment Kindergarten	53	9	1.14	17	9	5.66
" Grades 1-3	66	9	4.86	34	9	8.67
" Grades 4-6	61	9	1.94	32	9	3.37
Textbook adoption practices						
75. No science textbook series adopted Kindergarten	76	3	1.81	37	3	2.54
76. " Grade 1	76	3	1.21	37	3	2.05
77. " Grade 2	76	3	1.06	37	3	2.54
78. " Grade 3	76	3	2.31	37	3	2.54
79. " Grade 4	76	3	1.01	37	3	2.54
80. " Grade 5	76	3	0.63	37	3	2.54
81. " Grade 6	76	3	1.93	37	3	3.87
82. Single science textbook series adopted Kindergarten	76	3	0.04	37	3	1.08
83. " Grade 1	76	3	1.84	37	3	2.78
84. " Grade 2	76	3	3.65	37	3	3.22
85. " Grade 3	76	3	5.09	37	3	3.22
86. " Grade 4	76	3	3.53	37	3	3.81

TABLE 2, cont.

Variable Name		Indiana			Oregon		
		N^a	d.f.^{b}	$\chi^{2\,b}$	N^a	d.f.^{b}	$\chi^{2\,b}$
87.	Grade 5	76	3	2.52	37	3	3.22
88.	Grade 6	76	3	0.88	37	3	2.87
89. Two or more science textbook series adopted	Kindergarten	76	3	5.08	37	3	0.84
90. "	Grade 1	76	3	4.75	37	3	3.60
91. "	Grade 2	76	3	4.75	37	3	3.60
92. "	Grade 3	76	3	6.15	37	3	3.60
93. "	Grade 4	76	3	6.99	37	3	5.89
94. "	Grade 5	76	3	6.06	37	3	3.60
95. "	Grade 6	76	3	5.66	37	3	3.60
Type of classroom for science							
96. Regular classroom with no special science facilities	Kindergarten	76	3	1.35	37	3	1.13
97. "	Grade 1	76	3	1.46	37	3	1.35
98. "	Grade 2	76	3	2.02	37	3	0.56
99. "	Grade 3	76	3	1.87	37	3	0.56
100. "	Grade 4	76	3	1.77	37	3	1.31
101. "	Grade 5	76	3	4.19	37	3	5.36
102. "	Grade 6	76	3	1.02	37	3	3.79
103. Regular classroom with special science facilities	Kindergarten	76	3	4.79	37	3	0.00
104. "	Grade 1	76	3	2.42	37	3	2.23
105. "	Grade 2	76	3	2.42	37	3	2.23
106. "	Grade 3	76	3	2.82	37	3	2.23
107. "	Grade 4	76	3	2.84	37	3	0.41
108. "	Grade 5	76	3	4.89	37	3	8.84
109. "	Grade 6	76	3	0.84	37	3	6.82
110. Special room to which children go for science	Kindergarten	76	3	0.00	37	3	0.00
111. "	Grade 1	76	3	0.00	37	3	0.00
112. "	Grade 2	76	3	0.00	37	3	0.00
113. "	Grade 3	76	3	0.00	37	3	0.00
114. "	Grade 4	76	3	0.81	37	3	0.00
115. "	Grade 5	76	3	0.81	37	3	1.08
116. "	Grade 6	76	3	5.84	37	3	0.19
Science course improvement project materials used							
117. Science Curriculum Improvement Study (SCIS)	Kindergarten	76	3	0.00	37	3	0.00
118. "	Grade 1	76	3	0.00	37	3	1.35
119. "	Grade 2	76	3	0.00	37	3	1.35
120. "	Grade 3	76	3	0.00	37	3	1.35
121. "	Grade 4	76	3	0.00	37	3	0.00
122. "	Grade 5	76	3	6.69	37	3	0.00
123. "	Grade 6	76	3	0.00	37	3	0.00
124. Elementary Science Study (ESS)	Kindergarten	76	3	0.00	37	3	1.08
125. "	Grade 1	76	3	0.00	37	3	0.00
126. "	Grade 2	76	3	0.96	37	3	1.35
127. "	Grade 3	76	3	0.00	37	3	0.19
128. "	Grade 4	76	3	0.96	37	3	0.19
129. "	Grade 5	76	3	1.95	37	3	0.56
130. "	Grade 6	76	3	0.96	37	3	0.19
131. Science--A Process Approach (S-APA)	Kindergarten	76	3	1.01	37	3	0.41
132. "	Grade 1	76	3	1.59	37	3	1.31
133. "	Grade 2	76	3	3.14	37	3	2.05
134. "	Grade 3	76	3	3.14	37	3	2.05
135. "	Grade 4	76	3	0.58	37	3	0.94
136. "	Grade 5	76	3	0.63	37	3	0.94
137. "	Grade 6	76	3	0.56	37	3	0.83

TABLE 2, cont.

Variable Name		Indiana			Oregon		
		Na	d.f.b	χ^2b	Na	d.f.b	χ^2b
138. Other science course improvement projects	Kindergarten	76	3	0.00	37	3	0.00
139. "	Grade 1	76	3	0.00	37	3	1.08
140. "	Grade 2	76	3	0.00	37	3	1.08
141. "	Grade 3	76	3	0.00	37	3	1.08
142. "	Grade 4	76	3	0.00	37	3	0.00
143. "	Grade 5	76	3	0.96	37	3	1.35
144. "	Grade 6	76	3	0.00	37	3	1.35
145. Definite procedures used to identify special student interests		74	3	2.56	35	3	1.96
146. Definite procedures used to identify students interested in science		70	3	0.95	35	3	4.62
147. Environmental and/or conservation science taught		72	3	0.69	35	3	3.90
Environmental and/or conservation science teaching pattern							
148. As a separate subject	Kindergarten	76	6	2.39	37	6	13.77
149. "	Grade 1	76	6	0.81	37	6	26.41
150. "	Grade 2	76	6	0.81	37	6	26.41
151. "	Grade 3	76	6	0.81	37	6	26.41
152. "	Grade 4	76	6	2.39	37	6	16.17
153. "	Grade 5	76	6	2.39	37	6	26.41
154. "	Grade 6	76	6	2.39	37	6	24.40
155. Taught with science	Kindergarten	76	6	1.21	37	6	10.46
156. "	Grade 1	76	6	2.98	37	6	12.62
157. "	Grade 2	76	6	3.88	37	6	12.62
158. "	Grade 3	76	6	3.19	37	6	12.93
159. "	Grade 4	76	6	2.78	37	6	12.04
160. "	Grade 5	76	6	3.12	37	6	12.62
161. "	Grade 6	76	6	3.15	37	6	10.51
162. Taught with social studies	Kindergarten	76	6	2.79	37	6	6.20
163. "	Grade 1	76	6	2.77	37	6	12.64
164. "	Grade 2	76	6	2.77	37	6	12.64
165. "	Grade 3	76	6	2.67	37	6	12.64
166. "	Grade 4	76	6	2.43	37	6	6.17
167. "	Grade 5	76	6	1.81	37	6	10.58
168. "	Grade 6	76	6	3.77	37	6	10.58
169. Taught with two or more subjects including science	Kindergarten	76	6	0.83	37	6	5.73
170. "	Grade 1	76	6	1.25	37	6	39.98
171. "	Grade 2	76	6	1.53	37	6	39.98
172. "	Grade 3	76	6	4.00	37	6	39.98
173. "	Grade 4	76	6	5.13	37	6	12.25
174. "	Grade 5	76	6	0.49	37	6	17.38
175. "	Grade 6	76	6	0.58	37	6	16.05
176. Taught with two or more subjects excluding science	Kindergarten	76	6	0.96	37	6	0.00
177. "	Grade 1	76	6	0.96	37	6	0.00
178. "	Grade 2	76	6	0.96	37	6	0.00
179. "	Grade 3	76	6	0.96	37	6	0.00
180. "	Grade 4	76	6	0.96	37	6	0.00
181. "	Grade 5	76	6	0.96	37	6	0.00
182. "	Grade 6	76	6	0.96	37	6	0.00
183. Environmental education facilities available		76	6	2.74	37	6	7.08

TABLE 2, cont.

Variable Name	Indiana			Oregon		
	N^a	$d.f.^b$	χ^{2b}	N^a	$d.f.^b$	χ^{2b}
184. Health education taught with science Kindergarten	76	6	5.55	37	6	4.30
185. Grade 1	76	6	6.00	37	6	4.12
186. Grade 2	76	6	6.00	37	6	7.42
187. Grade 3	76	6	6.24	37	6	7.42
188. Grade 4	76	6	8.06	37	6	4.64
189. Grade 5	76	6	8.06	37	6	3.82
190. Grade 6	76	6	8.51	37	6	4.96
191. Narcotics or drug abuse education taught	76	6	2.09	37	6	7.88
192. Narcotics and drug abuse education taught with science Kindergarten	76	6	1.05	37	6	14.10
193. Grade 1	76	6	2.94	37	6	14.10
194. Grade 2	76	6	5.76	37	6	14.10
195. Grade 3	76	6	3.45	37	6	16.84
196. Grade 4	76	6	0.36	37	6	20.95
197. Grade 5	76	6	2.01	37	6	25.06
198. Grade 6	76	6	2.94	37	6	16.84
199. Science consultant or supervisor help available	76	6	7.72	37	6	6.12
200. General elementary supervisor available, general knowledge of science	75	6	3.57	37	6	7.84
201. General supervisor with special science competence	75	6	3.65	37	6	8.49
202. Elementary science consultant, supervisor, or specialist	76	6	5.17	37	6	8.30
203. Classroom teacher with special science training	75	6	9.83	37	6	6.65
204. High school science teacher	76	6	7.48	37	6	6.55
205. Other consultant help available	75	6	3.65	37	6	8.49
206. Extent of consultant usage Kindergarten	76	9	4.57	37	9	2.29
207. Grade 1	76	9	9.15	37	9	10.54
208. Grade 2	76	9	5.78	37	9	11.32
209. Grade 3	76	9	7.63	37	9	12.29
210. Grade 4	76	9	7.37	37	9	10.59
211. Grade 5	76	9	11.50	37	9	7.93
212. Grade 6	76	9	13.75	37	9	8.25
213. Consultant plans or works with teacher Kindergarten	10	6	1.11	4	6	1.33
214. Grades 1-3	18	6	5.33	13	6	3.85
215. Grades 4-6	19	6	5.11	13	6	1.00
216. Consultant teachers science lessons in classroom Kindergarten	9	6	2.06	4	6	0.00
217. Grades 1-3	15	6	1.07	13	6	0.75
218. Grades 4-6	16	6	1.07	14	6	0.06
219. Consultant introduces science units Kindergarten	9	6	2.06	4	6	0.00
220. Grades 1-3	14	6	2.29	13	6	0.04
221. Grades 4-6	16	6	1.40	14	6	1.59
222. Consultant provides materials Kindergarten	11	6	4.30	5	6	0.83
223. Grades 1-3	16	6	11.15	13	6	6.80
224. Grades 4-6	18	6	2.98	14	6	0.93

TABLE 2, cont.

Variable Name	Indiana N	Indiana d.f.	Indiana χ^2	Oregon N	Oregon d.f.	Oregon χ^2
225. Consultant helps plan field trips Kindergarten	9	6	1.44	4	6	0.00
226. Grades 1-3	14	6	4.32	13	6	1.17
227. Grades 4-6	15	6	2.80	14	6	0.06
228. Consultant evaluates science teaching Kindergarten	9	6	0.23	4	6	0.00
229. Grades 1-3	14	6	0.53	13	6	0.13
230. Grades 4-6	15	6	0.94	14	6	0.21
231. Consultant demonstrates teaching to teacher groups Kindergarten	10	6	2.86	4	6	0.00
232. Grades 1-3	14	6	2.12	13	6	2.25
233. Grades 4-6	16	6	2.98	14	6	10.13
234. Consultant organizes and directs teacher workshops Kindergarten	10	6	2.92	4	6	4.00
235. Grades 1-3	14	6	2.71	13	6	2.25
236. Grades 4-6	15	6	2.97	14	6	1.95
237. Consultant works with small groups of children Kindergarten	8	6	0.53	5	6	0.83
238. Grades 1-3	12	6	0.43	13	6	0.44
239. Grades 4-6	13	6	0.65	14	6	0.28
240. Consultant works in other ways Kindergarten	0	-	-	2	6	0.00
241. Grades 1-3	0	-	-	3	6	0.75
242. Grades 4-6	0	-	-	3	6	0.00
Opportunities for inservice education						
243. Teachers' meetings	71	6	0.96	37	6	0.66
244. Curriculum development and revision	71	6	1.52	37	6	1.31
245. Elementary science courses	71	6	0.74	37	6	0.56
246. Elementary science workshops	71	6	1.45	37	6	3.52
247. Visitations and teaching demonstrations	71	6	1.85	37	6	11.37
248. Television and radio programs	71	6	1.14	37	6	4.06
249. Other inservice activities undertaken	71	6	1.94	37	6	0.41

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[a] Number of usable responses.

[b] Degrees of freedom and chi square values for uncollapsed data.

TABLE 3
CHI SQUARE VALUES FOR TEACHER RESPONDENT VARIABLES ASSOCIATED WITH SCHOOL ENROLLMENT SIZE FROM DATA OF THE TWO COMBINED REGIONS[b]

	Variable Name	N[a]	d.f.[b]	χ^2
1.	Sex	814	6	15.98
2.	Degree held; Masters	811	3	15.01
3.	Background in undergraduate biological sciences	815	12	23.57
4.	Background in undergraduate physical sciences	815	12	24.94
5.	Background in graduate science education	815	9	23.9
6.	Science inservice programs; teachers' meetings	815	6	15.45
7.	Inservice curriculum development and revision	815	6	13.39
8.	Inservice elementary science courses	815	6	13.89
9.	Inservice elementary science workshops	815	6	16.34
10.	Inservice visitations and demonstration teaching	815	6	14.26
11.	Inservice television and radio programs	815	6	13.68
12.	Other inservice science education programs	815	6	17.47
13.	Science equipment adequate	815	9	18.34
14.	Opaque projector available	815	3	19.21

TABLE 3, cont.

	Variable Name	N[a]	d.f.[b]	χ^2
15.	Micro-projector available	815	3	21.04
16.	Number of students in sample class	815	15	91.3
17.	Number of times per week sample class taught	815	15	43.52
18.	Teacher's role in sample class	815	24	57.11
19.	Type of room used for sample class	815	12	29.72
20.	Textbooks used, type, 3	814	6	21.50
21.	Textbooks used, publication date 3	815	15	59.52

TABLE 4
CHI SQUARE VALUES FOR TEACHER RESPONDENT VARIABLES NOT ASSOCIATED WITH SCHOOL ENROLLMENT SIZE FROM DATA OF THE TWO COMBINED REGIONS

Variable Name	N[a]	d.f.[b]	χ^2[b]
Basis of employment: full or part time	815	6	2.85
Age	815	18	17.82
Years of teaching experience; elementary school	815	12	10.00
Years of teaching experience; secondary school	815	6	8.41
Years of experience teaching science; elementary school	815	12	6.41
Years of experience in school system	815	6	7.32
Degree held; Bachelors	813	3	3.94
Degree held; Doctorate	809	3	3.87
Degree held; Specialist	811	3	6.82
No degree held	811	3	6.15
Degree held; other	811	3	0.62
Enrolled in degree program	796	3	1.88
Program enrolled in	815	15	6.38
Background in undergraduate earth sciences	815	12	11.44
Background in undergraduate math	815	12	16.02

TABLE 4, cont.

Variable Name	N[a]	d.f.[b]	χ^2 [b]
Background in undergraduate science teaching methods	815	12	17.69
Undergraduate student teaching in science	815	12	15.84
Background in graduate biology	815	9	11.76
Background in graduate physics	815	9	12.52
Background in graduate earth science	815	9	11.53
Background in graduate math	815	9	7.01
Science Course Improvement Project taught; 1	807	39	18.98
Science Course Improvement Project workshop; 1	813	6	10.70
Science Course Improvement Project taught; 2	811	39	23.12
Science Course Improvement Project workshop; 2	813	6	7.72
Science Course Improvement Project taught; 3	812	39	14.63
Science Course Improvement Project workshop; 3	812	6	2.84
Science Course Improvement Project taught; 4	812	39	1.58
Science Course Improvement Project workshop; 4	813	6	3.97
Science facilities available; audio-tutorial lab.	814	3	1.17

TABLE 4, cont.

Variable Name	N[a]	d.f.[b]	χ^2 [b]
Closed circuit television available	812	6	2.66
Computer terminals available	815	3	1.55
Greenhouse available	815	3	3.34
Observatory available	814	3	3.53
Outdoor laboratory available	815	3	6.76
Planetarium available	815	3	1.26
Science darkroom available	815	3	9.91[c]
Science museum available	814	3	3.26
Ventilated animal housing available	815	3	14.01[c]
Weather station available	814	3	1.71
Science supplies adequate	815	9	16.11
Audio-visual aids available; movie projectors	815	3	5.88
Film loop projector available	815	3	2.45
Slide projector available	815	3	4.28
Overhead projector available	815	3	31.92[c]
Phonograph available	815	3	0.41
Tape recorder available	815	3	3.36
Television available	815	3	3.42
Commercial models available	815	3	5.50
Commercial charts available	814	3	5.30

TABLE 4, cont.

Variable Name	N[a]	d.f.[b]	χ^2 [b]
Teaching problems; inadequate room facilities	815	9	3.75
Teaching problems; lack of supplies & equipment	815	9	17.31[c]
Teaching problems; lack of funds for supplies	815	9	7.17
Teaching problems; lack of community support	815	9	10.50
Teaching problems; inability to improvise	815	9	7.44
Teaching problems; inadequate knowledge of science	815	9	11.21
Teaching problems; inadequate knowledge of methods	815	9	6.32
Teaching problems; inadequate consultant service	815	9	10.51
Teaching problems; lack of teacher interest	815	9	15.21
Teaching problems; vague science program	815	9	8.55
Teaching problems; science considered unimportant	814	9	7.92
Teaching problems; lack of time to teach science	815	9	8.85
Teaching problems; lack of inservice opportunities	815	9	10.03
Other teaching problems	815	9	7.30
Minutes per week sample class taught science	815	24	17.50

TABLE 4, cont.

Variable Name	N[a]	d.f.[b]	χ^2 [b]
Teaching pattern used in sample class	815	18	117.06[c]
Single text with lab manual used	815	3	1.28
Locally prepared curriculum material used	814	3	2.90
Single textbook used	813	3	5.78
Separate laboratory manual used	815	3	4.71
Multiple textbooks including lab manuals used	815	3	5.05
Other curriculum material used	815	3	4.40
Multiple textbooks used	811	3	6.07
Textbooks used; type, 1	815	6	5.27
Textbooks used; published, 1	814	60	148.94
Textbooks used; date published, 1	810	15	18.27
Textbooks used; type, 2	813	6	7.82
Textbooks used; publisher, 2	813	60	262.87[c]
Tectbooks used; publication date, 2	815	15	44.82[c]
Textbooks used; publisher, 3	815	60	158.64[d]
Additional text or materials used	815	3	11.29[c]
Science Course Improvement Project used, name, 1	815	33	21.74
SCIP printed materials used, 1	111	3	0.20
SCIP kits used, 1	116	3	1.03

TABLE 4, cont.

Variable Name	N[a]	d.f.[b]	χ^2 [b]
SCIP proportion used in sample class, 1	111	9	2.15
SCIP used, name, 2	815	33	18.04
SCIP printed materials used, 2	21	3	1.08
SCIP kits used, 2	21	3	0.90
SCIP proportion used in sample class, 2	20	9	8.00
SCIP used, name, 3	815	33	17.97
SCIP printed material used, 3	815	3	0.87
SCIP kits used, 3	8	3	3.2
SCIP proportion used in sample class, 3	6	9	0.0
Learning activities used most often; lecture	815	12	19.37
Learning activity used most often; individual lab	815	12	17.99
Learning activity used most often; lecture/discussion	815	12	27.56[c]
Learning activity used most often; group lab	815	12	5.74
Learning activity used most often; small group discussion	815	12	17.45
Learning activity used most often; in-class written assignments	815	12	5.91
Learning activity used most often; science demonstration	815	12	23.64[c]

TABLE 4, cont.

Variable Names	N[a]	d.f.[b]	χ^2 [b]
Learning activity used most often; field work	815	12	51.61[c]
Learning activity used most often; films	815	12	15.84[c]
Learning activity used most often; programmed instruction	815	12	7.24
Learning activity used most often; independent study	815	12	6.81
Learning activity used most often; audio-tutorials	815	12	6.91
Learning activity used most often; televised instruction	813	12	3.92
Satisfaction with teaching science	815	15	22.04

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[a] Number of usable responses. [b] Degrees of freedom and chi square values for uncollapsed data. [c] Probability > .05 with collapsed data, expected value > 5. [d] Apparent significance due to high χ^2 value was due to small number of cases reporting use of third textbook. No basis existed for combining cells with expected number ≤ 5.

TABLE 5

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF THE CURRICULUM IN KINDERGARTEN[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Kindergarten
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	9.7	16.4	6.7	46.1	21.2
Indiana	91	13.2	19.8	3.3	30.8	33.0
Michigan	145	4.1	19.3	6.9	51.7	17.9
Ohio	276	10.9	11.6	5.1	48.2	24.3
Wisconsin	74	4.1	9.5	5.4	66.2	14.9
Alaska	4	25.0	0.0	0.0	75.0	0.0
California	278	2.9	11.9	4.7	62.6	18.0
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	9.1	9.1	18.2	36.4	27.3
Oregon	51	0.0	2.0	0.0	23.5	74.5
Washington	74	5.4	13.5	8.1	52.7	20.3
Region I	751	8.9	15.1	5.6	47.9	22.5
Region II	434	3.2	10.6	4.8	56.9	24.4

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[a] Percentages may not equal 100 due to rounding.

TABLE 6

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF CURRICULUM IN GRADE ONE[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade One
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	0.6	7.9	12.7	65.5	13.3
Indiana	91	8.8	23.1	14.3	45.1	8.8
Michigan	145	2.1	13.1	6.2	64.8	13.8
Ohio	276	5.4	12.7	5.8	62.0	14.1
Wisconsin	74	0.0	5.4	9.5	75.7	9.5
Alaska	4	0.0	25.0	0.0	75.0	0.0
California	278	1.4	8.6	6.1	69.1	14.8
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	9.1	9.1	9.1	54.6	18.2
Oregon	51	3.9	2.0	3.9	78.4	11.8
Washington	74	2.7	10.8	13.5	66.2	6.8
Region I	751	3.7	12.3	8.8	62.5	12.8
Region II	434	2.1	8.3	6.9	70.3	12.4

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[a] Percentages may not equal 100 due to rounding.

TABLE 7

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF CURRICULUM IN GRADE TWO[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade Two
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	1.2	3.0	9.7	73.3	12.7
Indiana	91	6.6	14.3	18.7	51.7	8.8
Michigan	145	2.1	6.9	7.6	71.0	12.4
Ohio	276	4.7	8.3	7.6	66.7	12.7
Wisconsin	74	0.0	5.4	6.8	78.4	9.5
Alaska	4	0.0	25.0	0.0	75.0	0.0
California	278	1.4	8.6	5.0	70.1	14.8
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	18.2	0.0	9.1	54.6	18.2
Oregon	51	2.0	2.0	2.0	82.4	11.8
Washington	74	2.7	10.8	13.5	66.2	6.8
Region I	751	3.3	7.3	9.3	68.2	11.9
Region II	434	2.1	8.1	6.0	71.4	12.4

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[a] Percentages may not equal 100 due to rounding.

TABLE 8

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF CURRICULUM IN GRADE THREE[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade Three
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	1.2	1.2	4.9	81.2	11.5
Indiana	91	4.4	5.5	20.9	60.4	8.8
Michigan	145	0.7	2.1	5.5	81.4	10.3
Ohio	276	2.5	4.4	6.9	75.0	11.2
Wisconsin	74	0.0	4.1	6.8	79.7	9.5
Alaska	4	0.0	0.0	25.0	75.0	0.0
California	278	1.4	7.6	4.7	71.9	14.4
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	18.2	0.0	9.1	63.6	9.1
Oregon	51	2.0	2.0	2.0	84.3	9.8
Washington	74	2.7	9.5	12.2	70.3	5.4
Region I	751	2.0	3.3	7.9	76.2	10.7
Region II	434	2.1	6.9	5.8	73.7	11.5

[a] Percentages may not equal 100 due to rounding.

TABLE 9

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF CURRICULUM IN GRADE FOUR[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade Four
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	1.2	0.6	1.8	84.9	11.5
Indiana	91	3.3	4.4	15.4	67.0	9.9
Michigan	145	0.7	2.8	3.5	84.1	9.0
Ohio	276	2.2	1.5	4.7	82.6	9.1
Wisconsin	74	0.0	2.7	5.4	82.4	9.5
Alaska	4	0.0	0.0	25.0	75.0	0.0
California	278	1.1	5.4	4.7	73.0	15.8
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	9.1	0.0	27.3	63.6	0.0
Oregon	51	2.0	2.0	2.0	76.5	17.7
Washington	74	2.7	6.8	6.8	75.7	8.1
Region I	751	1.6	2.0	5.2	81.4	9.9
Region II	434	1.6	5.1	5.3	74.4	13.6

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[a] Percentages may not equal 100 due to rounding.

TABLE 10

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE WAS TAUGHT AS A DEFINITE PART OF THE CURRICULUM IN GRADE FIVE[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade Five
		Not at all	Less Than half year	Half year only	More than half year	
Illinois	165	1.2	0.0	1.8	84.2	12.7
Indiana	91	3.3	3.3	12.1	68.1	13.2
Michigan	145	1.4	3.5	2.1	82.8	10.3
Ohio	276	1.8	1.5	2.9	80.1	13.8
Wisconsin	74	0.0	2.7	4.1	79.7	13.5
Alaska	4	0.0	0.0	0.0	100.0	0.0
California	278	1.1	5.0	4.3	74.5	15.1
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	9.1	0.0	27.3	63.6	0.0
Oregon	51	2.0	0.0	2.0	78.4	17.7
Washington	74	2.7	6.8	4.1	75.7	10.8
Region I	751	1.6	1.9	3.7	79.9	12.9
Region II	434	1.6	4.6	4.4	75.8	13.6

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[a] Percentages may not equal 100 due to rounding.

TABLE 11

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN PORTIONS OF SCHOOL YEAR IN WHICH SCIENCE IS TAUGHT AS A DEFINITE PART OF CURRICULUM IN GRADE SIX[a]

State & Region	Sample Size	Portion of School Year Science is Taught				Non-Response and no Grade Six
		Not at all	Less than half year	Half year only	More than half year	
Illinois	165	0.6	0.0	1.2	72.1	26.1
Indiana	91	3.3	2.2	8.8	62.6	23.1
Michigan	145	1.4	2.8	2.1	72.4	21.4
Ohio	276	1.5	1.1	1.5	73.9	22.1
Wisconsin	74	0.0	1.4	4.1	70.3	24.3
Alaska	4	0.0	0.0	0.0	75.0	25.0
California	278	1.4	4.7	4.0	70.1	19.8
Hawaii	16	0.0	6.3	0.0	93.8	0.0
Nevada	11	9.1	0.0	18.2	54.6	18.2
Oregon	51	2.0	2.0	0.0	74.5	21.6
Washington	74	2.7	6.8	4.1	71.6	14.9
Region I	751	1.3	1.3	2.7	71.5	23.2
Region II	434	1.8	4.6	3.7	71.4	18.4

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[a] Percentages may not equal 100 due to rounding.

TABLE 12

ADMINISTRATIVE ORGANIZATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING DEPARTMENTALIZED SCIENCE AT CERTAIN GRADE LEVELS[a]

State & Region	Sample Size	Grade Level Departmentalized								
		At any grade level	Kinder-garten	First	Second	Third	Fourth	Fifth	Sixth	Non-Response
Illinois	165	57.6	0.0	1.2	1.8	2.4	10.9	20.6	33.9	0.6
Indiana	91	42.9	0.0	2.2	0.0	0.0	8.8	23.1	36.3	2.2
Michigan	145	45.5	0.7	2.1	2.1	8.3	15.2	24.1	39.3	0.7
Ohio	276	47.8	1.1	2.5	2.9	3.6	12.3	25.4	33.0	1.5
Wisconsin	74	47.3	0.0	0.0	1.4	5.4	13.5	18.9	31.1	1.4
Alaska	4	75.0	0.0	0.0	0.0	0.0	0.0	25.0	75.0	0.0
California	278	43.5	1.4	3.6	5.0	5.8	14.0	22.7	23.4	2.5
Hawaii	16	56.3	0.0	0.0	6.3	6.3	37.5	43.8	50.0	12.5
Nevada	11	54.6	0.0	0.0	0.0	0.0	18.2	36.4	45.5	0.0
Oregon	51	37.3	0.0	0.0	0.0	3.9	7.8	13.7	21.6	0.0
Washington	74	27.0	0.0	4.1	4.1	5.4	8.1	13.5	18.9	1.4
Region I	751	48.9	0.5	1.9	2.0	4.0	12.3	23.2	34.6	1.3
Region II	434	41.0	0.9	3.0	4.2	5.3	13.1	21.2	24.4	2.3

TABLE 13
SCHOOL ORGANIZATION FOR SCIENCE TEACHING: PERCENT OF TEACHERS BY STATE AND REGION REPORTING CERTAIN NUMBER OF TIMES PER WEEK SCIENCE IS TAUGHT TO SELECTED SCIENCE CLASS

State & Region	Sample Size	Number of Times Science Is Taught Per Week 1	2	3	4	5
Illinois	158	0.6	8.9	19.0	16.5	53.2
Indiana	91	3.3	14.3	17.6	22.0	38.5
Michigan	131	2.3	16.8	26.0	16.0	35.1
Ohio	275	4.4	9.8	20.0	13.5	46.9
Wisconsin	68	2.9	7.4	11.8	20.6	57.4
Alaska	5	0.0	0.0	40.0	0.0	40.0
California	260	11.5	20.4	19.6	15.0	25.4
Hawaii	17	11.8	52.9	23.5	0.0	5.9
Nevada	10	0.0	0.0	30.0	10.0	50.0
Oregon	42	9.5	28.6	23.8	7.1	28.6
Washington	69	4.4	15.9	33.3	14.5	27.5
Region I	723	2.9	11.2	20.2	16.5	46.3
Region II	403	9.7	21.1	23.1	13.2	26.3

TABLE 14

ADMINISTRATIVE ORGANIZATION: PERCENT OF TEACHER RESPONDENTS BY STATE AND REGION REPORTING CERTAIN NUMBERS OF MINUTES OF SCIENCE INSTRUCTION PER WEEK FOR SELECTED SCIENCE CLASS[a]

State & Region	Sample Size	Number of Minutes per Week								
		1-30	31-60	61-90	91-120	121-150	151-180	181-210	211-240	240 or more
Illinois	165	0.6	3.8	13.9	8.9	13.9	9.5	20.9	15.8	10.1
Indiana	91	2.2	6.6	12.1	20.9	18.7	7.7	14.3	9.9	2.2
Michigan	131	1.5	10.7	16.0	13.0	16.0	10.7	15.3	7.6	4.6
Ohio	275	6.9	13.8	8.4	11.3	8.7	8.0	11.6	9.5	8.0
Wisconsin	68	1.5	5.9	8.8	10.2	13.2	10.3	17.7	16.2	16.2
Alaska	5	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0
California	260	3.1	15.8	14.6	15.4	11.9	9.6	5.0	7.3	8.5
Hawaii	17	5.9	23.5	52.9	0.0	5.9	0.0	5.9	0.0	5.9
Nevada	10	0.0	0.0	10.0	0.0	40.0	10.0	10.0	10.0	0.0
Oregon	42	2.4	33.3	14.3	14.3	4.8	11.9	2.4	4.8	4.8
Washington	69	0.0	7.3	24.6	13.1	10.2	15.9	11.6	5.8	7.3
Region I	723	3.3	9.7	11.5	12.2	13.0	9.2	15.2	2.2	8.1
Region II	403	2.5	16.1	17.6	13.7	11.4	10.4	6.2	6.5	7.7

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[a] Percentages may not equal 100 due to rounding.

TABLE 15

ADMINISTRATIVE ORGANIZATION: PERCENT OF TEACHER RESPONDENTS BY STATE AND REGION REPORTING CERTAIN STUDENT ENROLLMENTS IN SELECTED SCIENCE CLASS

		Number of Students					
State & Region	Sample Size	Less than 20	20-24	25-29	30-34	35 or More	Non-Response
Illinois	158	7.6	23.4	33.6	22.8	10.8	1.9
Indiana	91	0.0	14.3	45.1	26.4	11.0	3.3
Michigan	131	0.0	12.2	38.2	35.1	9.9	4.6
Ohio	275	4.0	18.9	33.1	31.6	7.6	4.7
Wisconsin	68	1.5	29.4	33.8	23.5	10.3	1.5
Alaska	5	0.0	60.0	20.0	0.0	0.0	20.0
California	260	3.5	5.0	24.2	43.1	18.8	5.4
Hawaii	17	5.9	0.0	35.3	29.4	29.4	0.0
Nevada	10	0.0	0.0	10.0	50.0	30.0	10.0
Oregon	42	4.8	30.9	45.2	9.5	4.8	4.8
Washington	69	5.8	18.9	26.1	36.2	11.6	1.5
Region I	723	3.3	19.3	36.0	29.2	9.4	2.8
Region II	403	4.0	10.4	27.1	37.5	16.6	4.5

TABLE 16
CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION EMPLOYED FULL TIME AND PERCENT MALE AND FEMALE

State & Region	Sample Size	Percent Full time	Percent Male	Percent Female	Non-Response
Illinois	158	96.8	48.7	50.6	0.6
Indiana	91	100.0	40.7	58.2	0.0
Michigan	131	97.7	35.1	64.9	0.8
Ohio	275	96.4	34.2	64.0	1.8
Wisconsin	68	98.5	48.5	50.0	0.0
Alaska	5	80.0	60.0	20.0	0.0
California	260	99.2	50.0	49.2	0.4
Hawaii	17	100.0	5.9	94.1	0.0
Nevada	10	100.0	60.0	40.0	0.0
Oregon	42	100.0	40.5	59.5	0.0
Washington	69	100.0	59.4	40.6	0.0
Region I	723	97.9	39.9	59.6	0.6
Region II	403	99.5	49.1	50.4	0.3

TABLE 17

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN AGES IN YEARS[a]

State & Region	Sample Size	Age in Years Under 30	30-39	40-49	50-59	60 or more	Non-Response
Illinois	158	33.6	20.3	13.9	8.2	1.9	22.2
Indiana	91	35.2	19.8	16.5	5.5	3.3	19.8
Michigan	131	32.1	19.1	13.7	9.9	1.5	23.7
Ohio	275	34.2	16.4	17.1	13.5	2.9	16.0
Wisconsin	68	23.5	27.9	8.8	16.2	1.5	22.1
Alaska	5	80.0	20.0	0.0	0.0	0.0	0.0
California	260	21.5	18.1	23.1	10.4	1.5	25.4
Hawaii	17	17.6	41.2	23.5	5.9	5.9	5.9
Nevada	10	0.0	20.0	40.0	0.0	0.0	40.0
Oregon	42	33.3	11.9	11.9	11.9	4.8	26.2
Washington	69	31.9	18.9	10.2	8.7	1.5	29.0
Region I	723	32.7	19.4	15.0	11.1	2.4	19.5
Region II	403	24.3	18.9	19.8	9.7	2.0	25.3

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[a] Percentages may not equal 100 due to rounding.

TABLE 18

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN YEARS OF TEACHING EXPERIENCE IN ELEMENTARY AND SECONDARY SCHOOLS[a]

		Years of Elementary School Experience					Years of Secondary School Experience		
State & Region	Sample Size	less than 5	5-9	10-19	20-29	30 or more	0	less than 5	5 or more
Illinois	158	41.8	23.4	26.0	6.3	2.5	89.2	7.6	3.2
Indiana	91	38.5	24.2	27.5	7.7	2.2	85.7	6.6	7.7
Michigan	131	36.6	24.4	25.2	9.2	3.1	91.6	3.8	4.6
Ohio	275	34.9	27.6	24.7	8.4	1.4	83.3	12.0	4.4
Wisconsin	68	22.1	30.9	36.8	7.4	2.9	91.2	7.4	1.5
Alaska	5	40.0	40.0	20.0	0.0	0.0	60.0	20.0	20.0
California	260	26.2	29.2	32.3	11.1	1.2	78.6	16.2	5.0
Hawaii	17	17.6	23.5	41.2	11.8	5.9	88.2	0.0	11.8
Nevada	10	40.0	30.0	30.0	0.0	0.0	70.0	30.0	0.0
Oregon	42	38.1	23.8	19.0	16.7	2.4	90.5	7.1	2.4
Washington	69	31.9	39.1	23.3	4.4	1.5	84.1	10.2	5.8
Region I	723	36.2	26.5	27.0	7.8	2.2	87.5	8.3	4.1
Region II	403	28.5	30.5	29.3	10.2	1.5	81.1	13.9	5.0

[a] Percentages may not equal 100 due to rounding.

TABLE 19
CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN YEARS OF TEACHING SCIENCE IN AN ELEMENTARY SCHOOL[a]

State & Region	Sample Size	Number of Years Teaching Science					Non-Response
		Less Than 5 Years	5-9 Years	10-19 Years	20-29 Years	30 or more Years	
Illinois	158	42.4	26.0	24.3	2.5	2.5	1.9
Indiana	91	39.6	25.3	26.4	6.6	1.1	1.1
Michigan	131	40.5	24.4	20.6	9.9	2.3	2.3
Ohio	275	37.1	27.3	23.7	6.2	1.1	4.7
Wisconsin	68	25.0	30.9	33.8	7.4	2.9	0.0
Alaska	5	40.0	40.0	20.0	0.0	0.0	0.0
California	260	27.7	31.2	28.1	8.5	0.8	3.8
Hawaii	17	11.8	29.4	35.3	17.6	5.9	0.0
Nevada	10	40.0	40.0	20.0	0.0	0.0	0.0
Oregon	42	38.1	23.8	19.0	16.7	2.4	0.0
Washington	69	33.3	40.6	21.8	2.9	0.0	1.5
Region I	723	38.2	26.7	24.5	6.3	1.8	2.5
Region II	403	29.5	32.5	25.8	8.4	1.0	2.7

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[a] Percentages may not equal 100 due to rounding.

TABLE 20
CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE HAVING CERTAIN YEARS OF TEACHING EXPERIENCE AT PRESENT SCHOOL SYSTEM

State & Region	Sample Size	Less than 5 years Experience	5 to 9 years Experience	10 or more years Experience	Non-Response
Illinois	158	53.2	24.1	21.4	0.6
Indiana	91	53.8	22.0	23.1	1.1
Michigan	131	50.4	21.4	25.9	2.3
Ohio	275	50.2	23.6	24.4	1.8
Wisconsin	68	41.2	33.8	23.5	1.5
Alaska	5	60.0	20.0	20.0	0.0
California	260	40.0	31.2	27.7	1.2
Hawaii	17	23.5	29.4	47.0	0.0
Nevada	10	40.0	30.0	20.0	10.0
Oregon	42	50.0	21.4	26.2	2.4
Washington	69	47.8	29.0	21.7	1.5
Region I	723	50.8	24.2	23.6	1.4
Region II	403	42.2	29.5	26.8	1.5

TABLE 21

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION HOLDING EACH TYPE OF COLLEGE DEGREE AND PERCENT ENROLLED IN A FORMAL DEGREE PROGRAM

State & Region	Sample Size	Degree Held			Enrolled in a Degree Program
		Bachelors Degree	Masters Degree	Doctors Degree	
Illinois	158	94.3	21.5	0.0	35.4
Indiana	91	96.7	52.8	0.0	31.9
Michigan	131	100.0	31.3	0.0	30.5
Ohio	275	92.7	17.1	0.7	22.2
Wisconsin	68	94.1	20.6	0.0	41.2
Alaska	5	80.0	20.0	20.0	20.0
California	260	98.5	23.5	0.0	18.5
Hawaii	17	94.1	17.7	5.8	94.1
Nevada	10	100.0	30.0	0.0	10.0
Oregon	42	100.0	19.1	0.0	28.6
Washington	69	97.1	26.1	1.5	23.2
Region I	723	95.6	25.5	0.3	29.8
Region II	403	98.3	23.3	0.5	19.4

TABLE 22

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN UNDERGRADUATE SEMESTER HOURS CREDIT IN BIOLOGICAL SCIENCES[a]

State & Region	Sample Size	Number of Semester Hours Credit				
		None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	10.1	13.9	20.3	30.4	25.3
Indiana	91	11.0	14.3	30.8	25.3	18.7
Michigan	131	16.0	7.6	26.7	27.5	22.1
Ohio	275	9.0	14.9	31.3	22.9	21.9
Wisconsin	68	23.5	17.7	19.1	26.5	13.3
Alaska	5	0.0	0.0	0.0	40.0	60.0
California	260	17.7	16.5	22.7	20.0	23.1
Hawaii	17	5.9	35.3	29.4	17.6	11.8
Nevada	10	60.0	0.0	10.0	10.0	20.0
Oregon	42	14.3	11.9	40.5	19.0	14.3
Washington	69	8.7	39.1	18.9	18.9	14.5
Region I	723	12.1	13.9	26.9	26.1	21.2
Region II	403	16.1	20.1	23.8	19.6	20.3

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[a] Percentages may not equal 100 due to rounding.

TABLE 23

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN UNDERGRADUATE SEMESTER HOURS CREDIT IN PHYSICAL SCIENCES[a]

State & Region	Sample Size	Number of Semester Hours Credit				
		None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	17.1	17.1	24.7	27.9	13.3
Indiana	91	22.0	16.5	30.8	22.0	8.8
Michigan	131	29.8	16.0	29.8	15.3	9.1
Ohio	275	17.5	27.6	29.8	14.2	10.9
Wisconsin	68	33.8	17.7	20.6	14.7	13.2
Alaska	5	0.0	20.0	20.0	20.0	40.0
California	260	17.7	21.9	25.4	17.3	17.7
Hawaii	17	17.6	41.2	23.5	5.9	11.8
Nevada	10	40.0	0.0	20.0	20.0	20.0
Oregon	42	19.1	23.8	38.1	4.8	14.3
Washington	69	18.8	29.0	17.4	20.3	14.5
Region I	723	21.5	21.1	28.3	18.4	11.2
Region II	403	18.4	23.6	25.3	16.1	16.6

[a] Percentages may not equal 100 due to rounding.

TABLE 24

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN UNDERGRADUATE SEMESTER HOURS CREDIT IN EARTH SCIENCES[a]

State & Region	Sample Size	Number of Semester Hours Credit				
		None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	51.9	21.5	13.3	9.5	3.8
Indiana	91	41.8	29.7	16.5	9.9	2.2
Michigan	131	51.9	24.4	14.5	6.1	3.1
Ohio	275	49.8	22.6	16.7	7.6	3.3
Wisconsin	68	45.6	19.1	14.7	14.7	5.9
Alaska	5	40.0	20.0	0.0	20.0	20.0
California	260	47.7	24.2	17.7	6.9	3.4
Hawaii	17	52.9	23.5	23.5	0.0	0.0
Nevada	10	60.0	0.0	20.0	20.0	0.0
Oregon	42	52.4	14.3	28.6	4.8	0.0
Washington	69	42.0	31.9	13.1	8.7	4.4
Region I	723	48.9	23.7	15.4	8.6	3.5
Region II	403	47.6	24.1	18.1	7.2	3.0

[a] Percentages may not equal 100 due to rounding.

TABLE 25

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN UNDERGRADUATE SEMESTER HOURS CREDIT IN MATHEMATICS

State & Region	Sample Size	Number of Semester Hours Credit None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	14.6	13.9	27.9	32.3	11.4
Indiana	91	16.5	13.2	30.8	33.0	6.6
Michigan	131	24.4	22.1	26.7	21.4	5.3
Ohio	275	20.0	18.5	31.6	24.0	5.8
Wisconsin	68	22.1	11.8	27.9	32.3	5.9
Alaska	5	0.0	20.0	20.0	0.0	60.0
California	260	23.1	18.5	23.5	20.4	14.6
Hawaii	17	47.1	23.5	5.9	23.5	0.0
Nevada	10	50.0	0.0	20.0	20.0	10.0
Oregon	42	19.1	11.9	42.9	23.8	2.4
Washington	69	24.6	21.7	20.3	24.7	8.7
Region I	723	19.3	17.0	29.5	27.4	6.8
Region II	403	24.3	18.4	24.1	21.3	11.9

[a] Percentages may not equal 100 due to rounding.

TABLE 26

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN NUMBERS OF UNDERGRADUATE CREDIT HOURS IN SCIENCE TEACHING METHODS[a]

		Number of Semester Hours Credit				
State & Region	Sample Size	None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	41.1	44.3	9.5	4.4	0.6
Indiana	91	23.1	56.1	18.7	1.1	1.1
Michigan	131	38.2	39.7	13.7	4.6	3.8
Ohio	275	34.2	45.1	14.9	5.1	0.7
Wisconsin	68	29.4	52.9	16.2	1.5	0.0
Alaska	5	20.0	40.0	20.0	0.0	20.0
California	260	42.3	40.0	12.3	3.1	2.3
Hawaii	17	17.7	70.6	5.9	5.9	0.0
Nevada	10	40.0	40.0	20.0	0.0	0.0
Oregon	42	45.2	33.3	16.7	0.0	4.8
Washington	69	26.1	62.3	8.7	2.9	0.0
Region I	723	34.4	46.4	14.3	4.0	1.0
Region II	403	38.7	44.4	12.2	2.7	2.0

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[a] Percentages may not equal 100 due to rounding.

TABLE 27

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN UNDERGRADUATE SEMESTER CREDIT HOURS IN STUDENT TEACHING IN SCIENCE[a]

State & Region	Sample Size	Number of Semester Hours Credit				
		None and Non-Response	1-3	4-6	7-12	13 or more
Illinois	158	76.6	7.0	7.0	8.9	0.6
Indiana	91	68.1	15.4	6.6	8.8	1.1
Michigan	131	76.3	10.7	5.3	6.9	0.8
Ohio	275	81.1	5.1	6.2	6.6	1.1
Wisconsin	68	70.6	13.2	11.8	4.4	0.0
Alaska	5	60.0	0.0	0.0	20.0	20.0
California	260	76.9	11.9	3.5	6.9	0.8
Hawaii	17	94.1	0.0	0.0	5.9	0.0
Nevada	10	90.0	0.0	0.0	10.0	0.0
Oregon	42	73.8	11.9	4.8	7.1	2.4
Washington	69	88.4	5.8	1.5	4.4	0.0
Region I	723	76.9	8.6	6.8	7.1	0.7
Region II	403	79.7	9.9	3.0	6.7	0.8

[a] Percentages may not equal 100 due to rounding.

TABLE 28

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION WITH ONE OR MORE SEMESTER HOURS GRADUATE CREDIT IN SCIENCE AND SCIENCE EDUCATION

State & Region	Sample Size	Biological Sciences	Physical Sciences	Earth Sciences	Mathematics	Science Education
Illinois	158	10.8	9.5	8.9	12.0	18.3
Indiana	91	16.5	14.3	15.4	36.3	31.9
Michigan	131	11.4	15.3	15.3	19.1	31.3
Ohio	275	5.8	6.2	7.3	9.8	14.9
Wisconsin	68	10.3	14.7	10.3	14.7	29.4
Alaska	5	20.0	60.0	20.0	40.0	40.0
California	260	25.4	16.1	14.2	30.4	32.3
Hawaii	17	23.5	11.8	17.6	29.4	41.2
Nevada	10	0.0	0.0	0.0	20.0	10.0
Oregon	42	21.4	16.7	16.7	23.8	42.9
Washington	69	5.8	11.6	14.5	26.1	42.0
Region I	723	9.4	10.1	10.0	15.5	21.6
Region II	403	20.6	15.1	14.1	28.5	34.7

TABLE 29

FACILITIES, EQUIPMENT AND SUPPLIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ANNUAL BUDGETS FOR SCIENCE; TEACHER PURCHASE OF SCIENCE EQUIPMENT AND SUPPLIES; USE OF NDEA FUNDS FOR SCIENCE AND USE OF ESEA FUNDS FOR SCIENCE

State & Region	Sample Size	Annual Budget for Science Equipment	Annual Budget for Science Supplies	Teacher Purchase of Equipment and Supplies	Use of NDEA Funds for Science Facilities	Use of NDEA Funds for Science Facilities Since September 1968	Use of NDEA Funds for Science Equipment	Use of NDEA Funds for Science Equipment Since September 1968	Use of ESEA Funds for Science Equipment	Use of ESEA Funds for Science Equipment Since September 1968
Illinois	165	50.3	58.2	81.2	24.3	14.6	67.9	48.9	37.6	31.5
Indiana	91	42.9	43.9	80.2	9.9	7.7	50.6	30.8	29.7	18.7
Michigan	145	44.8	56.5	76.6	10.6	9.7	69.7	45.9	42.8	34.5
Ohio	276	48.6	49.8	71.0	12.3	9.8	67.3	52.9	43.1	37.7
Wisconsin	74	66.2	63.5	73.0	8.1	6.8	73.3	51.4	40.5	31.1
Alaska	4	50.0	50.0	75.0	0.0	0.0	50.0	50.0	0.0	0.0
California	278	43.3	61.1	82.7	8.6	5.0	48.6	26.3	29.5	19.4
Hawaii	16	93.7	93.7	93.8	6.3	6.3	75.0	56.3	18.8	6.3
Nevada	11	81.8	72.7	72.7	0.0	0.0	36.4	9.1	45.5	27.3
Oregon	51	64.7	82.4	86.3	7.8	0.0	47.1	21.6	13.7	9.8
Washington	74	43.2	55.4	71.6	12.2	10.8	52.7	35.1	18.9	18.9
Region I	751	46.4	51.4	75.6	15.8	10.3	66.2	47.8	40.1	32.8
Region II	434	46.8	64.3	81.3	9.6	5.3	49.8	28.1	25.6	17.7

TABLE 30

SCIENCE EQUIPMENT AND SUPPLIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN LEVELS OF ADEQUACY FOR SCIENCE SUPPLIES AND EQUIPMENT IN KINDERGARTEN

		Level of Adequacy: Supplies				Level of Adequacy: Equipment			
State & Region	Sample Size	Completely Lacking	Inadequate	Adequate	Non-Response and no Kindergarten	Completely Lacking	Inadequate	Adequate	Non-Response and no Kindergarten
Illinois	165	5.5	33.0	51.5	19.4	3.6	26.1	48.5	21.2
Indiana	91	5.5	29.7	36.3	28.6	6.6	25.3	35.2	33.0
Michigan	145	5.5	31.0	46.9	16.6	5.5	31.7	44.8	17.9
Ohio	276	5.8	35.1	37.0	21.7	5.1	33.7	36.2	24.6
Wisconsin	74	1.4	16.2	66.2	16.2	2.7	16.2	63.5	17.6
Alaska	4	0.0	25.0	75.0	0.0	0.0	25.0	75.0	0.0
California	278	2.5	37.1	41.4	18.4	2.5	40.7	33.8	22.3
Hawaii	16	0.0	37.5	62.5	0.0	0.0	37.5	62.5	0.0
Nevada	11	9.1	36.4	45.5	9.1	18.2	18.2	36.4	27.3
Oregon	51	2.0	9.8	25.5	62.8	0.0	11.8	29.4	58.8
Washington	74	2.7	28.4	48.7	20.3	2.7	24.3	51.4	21.6
Region I	751	5.2	29.2	44.9	20.5	4.8	28.9	43.1	22.9
Region II	434	2.5	32.3	41.9	22.8	2.5	33.6	37.8	25.6

TABLE 31

SCIENCE EQUIPMENT AND SUPPLIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN LEVELS OF ADEQUACY FOR SCIENCE SUPPLIES AND EQUIPMENT IN GRADES ONE, TWO AND THREE

State & Region	Sample Size	Level of Adequacy: Supplies				Level of Adequacy: Equipment			
		Completely Lacking	Inadequate	Adequate	Non-Response and nc Grades One, Two, Three	Completely Lacking	Inadequate	Adequate	Non-Response and no Grades One, Two, Three
Illinois	165	2.4	28.5	55.8	12.7	1.8	30.3	53.2	13.9
Indiana	91	3.3	41.8	45.1	9.9	3.3	41.7	39.6	15.4
Michigan	145	2.1	38.6	49.7	9.7	3.5	37.2	47.6	11.7
Ohio	276	5.1	38.8	46.0	9.8	3.3	40.9	42.4	13.0
Wisconsin	74	0.0	24.3	68.9	6.8	0.0	24.3	67.6	8.1
Alaska	4	0.0	25.0	75.0	0.0	0.0	25.0	75.0	0.0
California	278	0.7	38.1	46.4	14.0	0.7	42.8	37.8	18.0
Hawaii	16	0.0	37.5	62.5	0.0	0.0	50.0	50.0	0.0
Nevada	11	0.0	54.6	36.4	9.1	0.0	45.5	36.4	18.2
Oregon	51	0.0	35.3	58.8	5.9	2.0	31.4	58.8	7.8
Washington	74	2.7	37.8	52.7	6.8	2.7	36.5	54.1	6.8
Region I	751	3.2	35.4	51.0	10.1	2.7	36.4	47.9	12.8
Region II	434	0.9	38.0	49.5	11.1	1.2	40.6	43.8	14.1

TABLE 32

SCIENCE EQUIPMENT AND SUPPLIES: PERCENT OF PRINCIPALS BE STATE AND REGION REPORTING CERTAIN LEVELS OF ADEQUACY FOR SCIENCE SUPPLIES AND EQUIPMENT IN GRADES FOUR, FIVE AND SIX

		Level of Adequacy: Supplies				Level of Adequacy: Equipment			
State & Region	Sample Size	Completely Lacking	Inadequate	Adequate	Non-Response and no Grade One, Two, Three	Completely Lacking	Inadequate	Adequate	Non-Response and no Grade One, Two, Three
Illinois	165	0.6	32.7	57.0	9.1	0.0	37.0	52.7	9.7
Indiana	91	0.0	36.3	51.7	12.1	1.1	33.0	46.2	19.8
Michigan	145	2.8	39.3	52.4	5.5	4.1	36.6	51.7	7.6
Ohio	276	2.2	35.9	53.6	8.0	2.5	38.4	49.3	9.4
Wisconsin	74	0.0	17.6	74.3	8.1	0.0	31.1	60.8	8.1
Alaska	4	0.0	25.0	75.0	0.0	0.0	25.0	75.0	0.0
California	278	0.4	39.6	47.8	11.5	0.4	43.2	41.0	14.8
Hawaii	16	0.0	25.0	68.8	6.3	0.0	43.8	56.3	0.0
Nevada	11	0.0	36.4	63.6	0.0	0.0	27.3	54.6	18.2
Oregon	51	0.0	33.3	58.8	7.8	2.0	33.3	52.9	11.8
Washington	74	0.0	43.2	48.7	8.1	1.4	36.5	54.1	8.1
Region I	751	3.2	35.4	51.0	10.1	1.9	36.4	51.3	10.3
Region II	434	0.2	38.7	50.7	9.9	0.7	40.3	45.9	12.7

TABLE 33

SCIENCE EQUIPMENT AND SUPPLIES: PERCENT OF TEACHERS BY STATE AND REGION REPORTING EXTENT OF ADEQUACY OF SCIENCE SUPPLIES AND EQUIPMENT

State & Region	Sample Size	Supplies			Equipment		
		Completely Lacking	Inadequate	Adequate	Completely Lacking	Inadequate	Adequate
Illinois	158	4.4	39.2	54.4	6.3	35.4	55.1
Indiana	91	3.3	39.6	53.9	4.4	42.9	49.5
Michigan	131	8.4	41.2	50.4	3.8	41.2	53.4
Ohio	275	8.0	42.9	48.0	6.9	43.6	47.6
Wisconsin	68	1.5	44.1	54.4	1.5	44.1	54.4
Alaska	5	20.0	60.0	20.0	0.0	80.0	0.0
California	260	3.9	41.5	53.5	3.5	48.5	46.9
Hawaii	17	0.0	41.2	58.8	0.0	47.1	52.9
Nevada	10	10.0	70.0	20.0	10.0	60.0	30.0
Oregon	42	0.0	42.9	57.1	0.0	50.0	50.0
Washington	69	7.3	43.5	49.3	4.4	46.4	46.4
Region I	723	5.7	41.6	51.8	5.4	41.6	51.7
Region II	403	4.0	42.9	52.4	3.2	48.9	46.7

TABLE 34
FACILITIES, EQUIPMENT AND SUPPLIES: PERCENT OF SCHOOLS BY STATE REPORTING HAVING CERTAIN SPECIAL SCIENCE FACILITIES

State & Region	Sample Size	Auto-Tutorial Laboratory	Closed Circuit Television	Computer Terminals	Green-house	Observatory	Outdoor Laboratory	Planetarium	Science Darkroom	Museum	Ventilated Animal Housing	Weather Station
Illinois	158	5.1	20.3	0.0	3.2	1.3	12.7	10.1	2.5	10.1	4.4	9.5
Indiana	91	8.8	15.4	3.3	7.7	6.6	13.2	19.8	5.5	9.9	4.4	13.2
Michigan	131	3.8	14.5	1.5	9.2	6.1	16.8	21.4	3.8	12.2	10.7	10.7
Ohio	275	5.8	24.0	0.7	6.6	5.1	14.6	17.8	3.6	13.1	4.7	6.9
Wisconsin	68	5.9	14.7	1.5	8.8	7.4	17.7	13.2	4.4	13.2	10.3	13.2
Alaska	5	20.0	80.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	20.0	40.0
California	260	9.2	21.2	0.0	2.3	8.1	11.2	17.7	5.0	15.4	11.2	10.0
Hawaii	17	5.8	35.3	0.0	0.0	11.8	0.0	29.4	0.0	11.8	17.7	11.8
Nevada	10	0.0	60.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	20.0
Oregon	42	0.0	28.6	0.0	7.1	2.4	19.1	11.9	0.0	16.7	11.9	16.7
Washington	69	13.0	23.2	2.9	1.5	1.5	29.0	11.6	1.5	15.9	8.7	15.9
Region I	723	5.7	19.9	1.1	6.1	4.7	14.7	16.8	3.6	12.1	5.7	9.[illegible]
Region II	403	8.4	24.3	0.5	2.5	6.2	14.4	16.6	3.5	14.9	10.7	12.7

TABLE 35

EQUIPMENT AND SUPPLIES: PERCENT OF TEACHERS BY STATE REPORTING CERTAIN AUDIO-VISUAL AIDS AVAILABLE FOR TEACHING SCIENCE

State & Region	Sample Size	Motion Picture Projector	Filmloop Projector	Slide Projector	Overhead Projector	Opaque Projector	Micro-Projector	Phonograph	Tape Recorder	Television	Commercial Models	Commercial Charts
Illinois	158	98.7	61.4	84.8	94.9	76.0	40.5	96.2	91.8	60.8	67.1	69.6
Indiana	91	97.8	56.0	87.9	96.[illegible]	84.6	38.5	95.6	96.7	58.2	61.5	63.7
Michigan	131	98.5	69.5	85.5	97.7	92.4	36.6	93.9	92.4	64.9	68.7	58.8
Ohio	275	96.7	60.7	81.5	94.9	82.6	29.8	93.8	89.1	65.5	64.7	63.6
Wisconsin	68	100.0	64.7	91.2	98.5	88.2	50.0	100.0	95.6	67.7	82.4	77.9
Alaska	5	80.0	80.0	80.0	80.0	60.0	40.0	80.0	80.0	80.0	80.0	80.0
California	260	98.9	63.9	90.0	95.4	75.0	40.4	94.6	92.7	75.4	71.9	62.7
Hawaii	17	100.0	70.6	100.0	100.0	41.8	29.1	100.0	94.1	94.1	70.6	94.1
Nevada	10	80.0	40.0	100.0	100.0	100.0	20.0	100.0	100.0	90.0	40.0	70.0
Oregon	42	100.0	71.4	90.5	100.0	95.2	52.4	92.9	97.6	81.0	83.3	73.8
Washington	69	100.0	66.7	92.8	97.1	92.8	52.2	97.1	94.2	81.2	82.6	75.4
Region I	723	98.8	62.9	85.0	96.7	84.4	36.8	95.8	92.4	64.3	67.5	65.9
Region II	403	98.8	65.3	91.3	96.5	79.4	42.9	95.3	93.8	78.2	74.4	68.0

TABLE 36

SCIENCE FACILITIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT SCIENCE WAS PREDOMINANTLY TAUGHT IN A REGULAR CLASSROOM WITH NO SPECIAL FACILITIES FOR SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	66.1	77.6	78.2	75.2	72.7	64.9	42.4
Indiana	91	50.6	74.7	79.1	76.9	71.4	59.3	42.9
Michigan	145	73.1	75.9	75.9	73.1	69.0	60.7	48.3
Ohio	276	66.3	77.5	78.3	80.1	75.0	65.2	53.6
Wisconsin	74	73.0	81.1	81.1	79.7	77.0	70.3	55.4
Alaska	4	100.0	100.0	100.0	100.0	100.0	75.0	25.0
California	278	77.0	80.9	80.6	78.8	76.3	73.0	65.8
Hawaii	16	100.0	100.0	100.0	100.0	81.3	81.3	81.3
Nevada	11	72.7	72.7	72.7	72.7	72.7	63.6	45.5
Oregon	51	31.4	92.2	94.1	94.1	84.3	82.4	74.5
Washington	74	70.3	82.4	81.1	81.1	78.4	77.0	68.9
Region I	751	66.3	77.2	78.2	77.2	73.0	64.1	49.0
Region II	434	71.4	83.2	83.0	81.8	77.9	74.9	67.1

TABLE 37

SCIENCE FACILITIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT SCIENCE WAS PREDOMINANTLY TAUGHT IN A REGULAR CLASSROOM WITH SPECIAL FACILITIES FOR SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	6.1	8.5	8.5	10.9	13.3	19.4	23.0
Indiana	91	9.9	16.5	16.5	17.6	18.7	24.2	26.4
Michigan	145	8.3	10.3	12.4	15.2	17.2	20.7	20.7
Ohio	276	6.5	7.6	8.0	9.4	13.4	16.3	18.1
Wisconsin	74	9.5	9.5	9.5	10.8	13.5	14.9	16.2
Alaska	4	0.0	0.0	0.0	0.0	0.0	25.0	50.0
California	278	3.2	4.0	4.0	4.7	4.7	6.5	6.8
Hawaii	16	18.8	0.0	0.0	0.0	18.8	18.8	18.8
Nevada	11	9.1	9.1	9.1	18.2	18.2	27.3	27.3
Oregon	51	0.0	7.8	7.8	7.8	11.8	11.8	13.7
Washington	74	5.4	6.8	6.8	6.8	8.1	6.8	9.5
Region I	751	7.5	9.6	10.1	12.0	14.8	18.6	20.5
Region II	434	3.2	4.8	4.8	5.5	6.9	8.3	9.5

TABLE 38

SCIENCE FACILITIES: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT SCIENCE WAS PREDOMINANTLY TAUGHT IN A SPECIAL ROOM TO WHICH CHILDREN GO FOR SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	0.0	0.0	0.6	0.6	3.0	5.5	10.3
Indiana	91	0.0	0.0	19.8	0.0	4.4	6.6	14.3
Michigan	145	1.4	2.1	2.1	6.2	8.3	12.4	16.6
Ohio	276	1.1	1.1	1.5	3.3	4.7	6.2	7.6
Wisconsin	74	0.0	0.0	0.0	1.4	1.4	1.4	6.8
Alaska	4	0.0	0.0	0.0	0.0	0.0	25.0	25.0
California	278	0.4	0.7	1.8	2.5	4.3	7.2	8.3
Hawaii	16	0.0	0.0	0.0	0.0	6.3	6.3	6.3
Nevada	11	0.0	0.0	0.0	9.1	18.2	18.2	18.2
Oregon	51	0.0	0.0	0.0	0.0	0.0	2.0	3.9
Washington	74	0.0	0.0	1.4	1.4	2.7	4.1	4.1
Region I	751	0.7	0.8	1.1	2.7	4.7	6.8	10.7
Region II	434	0.2	0.5	1.4	2.1	3.9	6.5	7.4

TABLE 39

SCIENCE FACILITIES: PERCENT OF TEACHERS BY STATE REPORTING CERTAIN KINDS OF ROOMS IN WHICH SELECTED CLASS WAS CONDUCTED

State & Region	Sample Size	Room Types: Laboratory or Special Science Room	Room Types: Classroom with Portable Science Kits or Materials	Room Types: No Science Facilities or Kits	Non-Response
Illinois	158	18.4	57.6	22.8	1.3
Indiana	91	12.1	60.4	25.3	2.2
Michigan	131	15.3	51.1	30.5	3.1
Ohio	275	11.3	64.0	21.8	2.9
Wisconsin	68	14.7	72.1	13.2	0.0
Alaska	5	0.0	40.0	60.0	0.0
California	260	9.2	74.6	13.9	2.3
Hawaii	17	5.9	70.6	23.5	0.0
Nevada	10	0.0	80.0	20.0	0.0
Oregon	42	9.5	76.2	14.3	0.0
Washington	69	7.3	63.8	29.0	0.0
Region I	723	14.0	61.2	23.3	1.5
Region II	403	8.4	72.5	17.6	1.5

TABLE 40
SCIENCE TEXTBOOKS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING NO SCIENCE TEXTBOOK SERIES ADOPTED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	30.9	14.6	12.1	9.1	7.3	6.1	1.8
Indiana	91	34.1	18.7	60.4	8.8	6.6	5.5	6.6
Michigan	145	35.9	20.7	17.9	9.7	6.2	7.6	6.2
Ohio	276	34.8	24.6	18.8	10.9	6.2	5.8	4.4
Wisconsin	74	39.2	21.6	20.3	14.9	13.5	10.8	9.5
Alaska	4	50.0	25.0	25.0	0.0	0.0	0.0	0.0
California	278	13.7	2.2	1.4	1.4	1.1	1.1	1.1
Hawaii	16	37.5	37.5	37.5	31.3	18.8	12.5	12.5
Nevada	11	18.2	9.1	0.0	0.0	0.0	0.0	0.0
Oregon	51	13.7	15.7	11.8	9.8	9.8	9.8	7.8
Washington	74	37.8	23.0	23.0	17.6	13.5	13.5	14.9
Region I	751	34.5	20.6	16.9	10.4	7.2	6.7	4.9
Region II	434	19.1	9.0	7.8	6.2	4.8	4.6	4.6

TABLE 41

SCIENCE TEXTBOOKS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING SINGLE SCIENCE TEXTBOOK SERIES ADOPTED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	18.8	55.2	58.2	62.4	63.0	66.4	52.7
Indiana	91	17.6	50.6	57.1	63.7	68.1	65.9	53.9
Michigan	145	20.7	49.0	52.4	61.4	66.2	63.5	56.6
Ohio	276	18.8	44.6	53.6	63.0	65.9	62.3	56.5
Wisconsin	74	17.6	46.0	47.3	51.4	51.4	48.7	40.5
Alaska	4	25.0	50.0	50.0	75.0	75.0	75.0	50.0
California	278	39.6	55.4	56.1	56.1	53.6	54.0	48.9
Hawaii	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nevada	11	27.3	36.4	45.5	54.6	54.6	54.6	54.6
Oregon	51	3.9	33.3	37.3	39.2	41.2	39.2	37.3
Washington	74	14.9	43.2	44.6	48.7	44.6	44.6	37.8
Region I	751	18.9	48.6	54.2	61.5	64.2	61.7	53.8
Region II	434	29.3	48.2	49.5	50.9	48.9	48.9	44.0

TABLE 42

SCIENCE TEXTBOOKS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING TWO OR MORE SCIENCE TEXTBOOK SERIES ADOPTED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	9.1	12.7	13.3	14.6	15.8	17.0	18.8
Indiana	91	6.6	16.5	17.6	15.4	13.2	15.4	12.1
Michigan	145	6.2	9.7	10.3	13.1	14.5	16.6	15.9
Ohio	276	5.8	10.5	12.0	15.2	17.4	17.0	14.5
Wisconsin	74	6.8	21.6	23.0	27.0	28.4	25.7	25.7
Alaska	4	25.0	25.0	25.0	25.0	25.0	25.0	25.0
California	278	18.0	26.6	26.6	26.6	29.1	29.5	30.2
Hawaii	16	37.5	56.3	56.3	56.3	62.5	75.0	75.0
Nevada	11	9.1	18.2	36.4	45.5	45.5	45.5	36.4
Oregon	51	11.8	39.2	39.2	39.2	35.3	37.3	37.3
Washington	74	8.1	20.3	20.3	27.0	35.1	33.8	29.7
Region I	751	6.8	12.7	13.7	15.9	17.0	17.6	16.5
Region II	434	16.1	27.9	28.3	29.7	32.5	33.2	32.7

TABLE 43

INSTRUCTIONAL MATERIALS: PERCENT OF TEACHER RESPONDENTS BY STATE AND REGION REPORTING USE OF CERTAIN TYPES OF MATERIALS WITH SELECTED SCIENCE CLASS[a]

State & Region	Sample Size	Single Textbook	Multiple Textbooks	Separate Laboratory Manual	Single Textbook Including Laboratory Manual	Multiple Textbooks Including Laboratory Manual	Locally Prepared Materials	Other
Illinois	158	46.2	15.2	5.7	20.9	14.7	27.9	22.2
Indiana	91	59.3	19.8	1.4	15.4	5.5	12.1	19.8
Michigan	131	45.0	19.1	8.4	18.3	11.5	29.0	28.2
Ohio	275	44.0	17.8	7.6	19.3	8.7	22.6	33.5
Wisconsin	68	25.0	32.4	11.8	23.5	10.3	33.8	27.9
Alaska	5	80.0	0.0	0.0	0.0	0.0	60.0	60.0
California	260	26.2	30.8	7.3	26.2	21.9	36.2	20.4
Hawaii	17	11.8	29.4	17.7	5.9	23.5	29.4	47.1
Nevada	10	50.0	20.0	0.0	[illegible]	20.0	10.0	10.0
Oregon	42	26.2	26.2	4.8	2.4	11.9	33.3	35.7
Washington	69	31.9	24.6	8.7	18.8	14.5	37.7	29.0
Region I	723	44.9	19.0	7.3	19.1	10.0	24.7	27.8
Region II	403	27.8	28.5	7.4	21.1	19.4	35.5	24.8

[a] Total may not equal 100 percent since some teachers may have used more than one type of curriculum material.

TABLE 44

SCIENCE COURSE IMPROVEMENT PROJECTS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT SCIENCE CURRICULUM IMPROVEMENT STUDY (SCIS) MATERIALS WERE USED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	1.8	2.4	2.4	2.4	1.8	1.8	0.0
Indiana	91	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Michigan	145	2.1	2.8	2.8	2.8	1.4	0.7	0.0
Ohio	276	1.1	3.3	3.3	2.9	1.8	1.5	1.5
Wisconsin	74	0.0	2.7	1.4	4.1	4.1	0.0	0.0
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	1.4	2.5	2.5	1.8	1.1	1.1	0.7
Hawaii	16	18.8	37.5	31.3	31.3	18.8	18.8	12.5
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	0.0	2.0	2.0	2.0	0.0	0.0	0.0
Washington	74	2.7	5.4	2.7	2.7	2.7	2.7	2.7
Region I	751	1.2	2.5	2.4	2.5	1.3	1.2	0.5
Region II	434	2.1	4.2	3.5	3.0	1.8	1.8	1.4

TABLE 45

SCIENCE COURSE IMPROVEMENT PROJECTS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT ELEMENTARY SCIENCE STUDY (ESS) MATERIALS WERE USED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	3.6	5.5	5.5	6.1	7.3	7.9	3.0
Indiana	91	0.0	0.0	1.1	0.0	1.1	2.2	1.1
Michigan	145	2.1	2.1	2.1	3.5	3.5	2.8	4.1
Ohio	276	0.7	1.5	1.8	2.2	2.9	4.0	2.9
Wisconsin	74	5.4	5.4	5.4	5.4	5.4	5.4	2.7
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	0.4	0.4	0.4	0.4	1.1	1.1	1.1
Hawaii	16	0.0	0.0	0.0	0.0	6.3	6.3	6.3
Nevada	11	0.0	0.0	0.0	9.1	9.1	9.1	9.1
Oregon	51	2.0	0.0	2.0	3.9	7.8	9.8	5.9
Washington	74	0.0	1.4	4.1	5.4	4.1	5.4	5.4
Region I	751	2.0	2.7	2.9	3.3	4.0	4.5	2.9
Region II	434	0.5	0.5	1.2	1.8	2.8	3.2	2.8

TABLE 46
SCIENCE COURSE IMPROVEMENT PROJECTS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT SCIENCE A PROCESS APPROACH (S-APA) MATERIALS WERE USED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	5.5	5.5	6.1	4.9	4.9	4.2	1.8
Indiana	91	7.7	9.9	12.1	11.0	5.5	6.6	4.4
Michigan	145	9.0	9.0	11.0	9.7	4.8	2.1	2.1
Ohio	276	2.9	4.4	4.7	4.4	4.0	3.3	2.9
Wisconsin	74	18.9	18.9	14.9	10.8	6.8	5.4	5.4
Alaska	4	25.0	25.0	25.0	25.0	25.0	25.0	25.0
California	278	1.1	1.8	1.8	1.8	1.1	1.4	1.1
Hawaii	16	6.3	6.3	6.3	6.3	12.5	12.5	6.3
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	9.8	21.6	19.6	19.6	19.6	19.6	19.6
Washington	74	13.5	12.2	9.5	9.5	5.4	8.1	8.1
Region I	751	6.8	7.2	8.1	6.9	4.8	3.9	2.9
Region II	434	11.3	8.[illegible]	6.5	9.0	7.4	5.5	5.8

TABLE 47

SCIENCE COURSE IMPROVEMENT PROJECTS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING THAT OTHER SCIENCE COURSE IMPROVEMENT PROJECTS WERE USED AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	3.0	6.1	7.3	6.7	6.7	5.5	4.2
Indiana	91	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Michigan	145	4.1	4.8	4.8	5.5	6.9	7.6	5.5
Ohio	276	0.7	1.5	1.5	1.5	1.8	1.5	1.5
Wisconsin	74	1.4	2.7	2.7	5.4	5.4	5.4	4.1
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	0.0	0.7	0.7	1.1	1.1	1.1	1.8
Hawaii	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nevada	11	0.0	0.0	0.0	9.1	9.1	9.1	9.1
Oregon	51	0.0	2.0	2.0	2.0	0.0	2.0	2.0
Washington	74	1.4	1.4	1.4	1.4	4.1	5.4	5.4
Region I	751	1.9	3.1	3.3	3.6	4.0	3.9	2.9
Region II	434	0.9	1.6	2.3	2.5	3.0	2.3	3.0

TABLE 48

INSTRUCTIONAL MATERIALS: PERCENT OF TEACHER RESPONDENTS BY STATE AND REGION REPORTING USE OF CERTAIN SCIENCE COURSE IMPROVEMENT PROJECT MATERIALS WITH SELECTED SCIENCE CLASS[a]

State & Region	Sample Size	Name of Science Course Improvement Project Materials			None Used
		AAAS--Science A Process Approach	Elementary Science Study	Science Curriculum Improvement Study	
Illinois	158	5.1	5.1	1.9	87.3
Indiana	91	7.7	2.2	0.0	90.1
Michigan	131	6.1	4.6	2.3	86.3
Ohio	275	3.6	1.5	2.2	89.8
Wisconsin	68	13.2	4.4	2.9	72.1
Alaska	5	40.0	20.0	0.0	60.0
California	260	0.4	1.9	1.5	95.8
Hawaii	17	23.5	11.8	17.7	58.8
Nevada	10	0.0	0.0	0.0	90.0
Oregon	42	38.1	11.9	2.4	50.0
Washington	69	8.7	10.2	4.4	78.3
Region I	723	5.7	3.2	1.9	87.4
Region II	403	7.2	5.0	2.7	85.9

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[a] Percentages may not equal 100 since some respondents report use of materials from more than one science course improvement project.

TABLE 49

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING TEACHING SCIENCE COURSE IMPROVEMENT PROJECTS AND ATTENDANCE AT A WORKSHOP SINCE SEPTEMBER 1968[a]

		Science Course Improvement Project				
State & Region	Sample Size	AAAS--Science A Process Approach	Elementary Science Study	Science Curriculum Improvement Project	None Reported	Attendance at a Workshop or Institute
Illinois	158	6.3	6.9	2.5	84.8	15.8
Indiana	91	7.7	6.9	2.2	90.1	11.0
Michigan	131	4.6	3.8	1.5	90.1	9.2
Ohio	275	3.3	1.8	3.6	89.1	6.9
Wisconsin	68	13.2	4.4	2.9	70.6	25.0
Alaska	5	40.0	0.0	0.0	40.0	80.0
California	260	0.4	2.3	2.3	93.9	5.0
Hawaii	17	17.6	5.9	17.7	64.7	29.4
Nevada	10	0.0	0.0	0.0	100.0	0.0
Oregon	42	35.7	9.5	2.4	59.5	42.9
Washington	69	11.6	10.1	8.7	71.0	20.3
Region I	723	5.7	3.7	2.5	87.4	11.4
Region II	403	7.4	4.5	4.0	84.6	13.2

[a] Percentages may not equal 100 due to rounding and due to some teachers reporting use of materials and attendance at workshops of more than one Science Course Improvement Project.

TABLE 50

PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING USE OF DEFINITE PROCEDURES FOR IDENTIFYING CHILDREN WITH SPECIAL INTERESTS, APTITUDES OR TALENT IN ANY CURRICULAR AREA AND FOR IDENTIFYING CHILDREN WITH SPECIAL INTEREST IN SCIENCE

State & Region	Sample Size	Use Definite Procedures for Identifying Special Interests in Any Curricular Area			Use Definite Procedures for Identifying Children with Special Interest in Science		
		Yes	No	Non-Response	Yes	No	Non-Response
Illinois	165	45.5	52.7	1.8	18.8	78.8	2.4
Indiana	91	36.3	59.3	4.4	18.7	71.4	9.9
Michigan	145	33.8	64.1	2.1	12.4	86.2	1.4
Ohio	276	42.8	54.0	3.3	13.8	82.6	3.6
Wisconsin	74	43.3	54.1	2.7	25.7	70.3	4.1
Alaska	4	0.0	100.0	0.0	0.0	100.0	0.0
California	278	52.5	43.5	4.0	18.0	77.3	4.7
Hawaii	16	6.3	93.8	0.0	0.0	100.0	0.0
Nevada	11	36.4	63.6	0.0	27.3	72.7	0.0
Oregon	51	35.3	60.8	3.9	21.6	74.5	3.9
Washington	74	29.7	66.2	4.1	12.2	86.5	1.4
Region I	751	40.9	56.3	2.8	16.4	79.9	3.7
Region II	434	44.0	52.3	3.7	16.8	79.5	3.7

TABLE 51

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT IN THEIR SCHOOL AND REPORTING SPECIAL FACILITIES AVAILABLE FOR ENVIRONMENTAL AND/OR CONSERVATION SCIENCE[a]

State & Region	Sample Size	Environmental and/or Conservation Science Taught			Special Facilities for Environmental and/or Conservation Science Available
		Yes	No	Non-Response	
Illinois	165	84.9	13.3	1.8	39.4
Indiana	91	70.3	24.2	5.5	36.3
Michigan	145	74.5	22.8	2.8	40.0
Ohio	276	80.8	14.1	5.1	43.1
Wisconsin	74	87.8	9.5	2.7	59.5
Alaska	4	100.0	0.0	0.0	75.0
California	278	87.4	6.5	6.1	42.5
Hawaii	16	93.8	6.3	0.0	31.3
Nevada	11	81.8	9.1	9.1	27.3
Oregon	51	88.2	7.8	3.9	68.6
Washington	74	91.9	5.4	2.7	63.5
Region I	751	79.9	16.4	3.7	42.5
Region II	434	88.5	6.5	5.1	48.6

[a] Percentages may not equal 100 due to rounding.

TABLE 52

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT AS A SEPARATE SUBJECT AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	3.0	1.2	1.8	0.6	0.6	0.6	1.8
Indiana	91	1.1	0.0	4.4	4.4	1.1	1.1	1.1
Michigan	145	2.8	2.1	2.1	1.4	4.4	2.8	2.1
Ohio	276	3.3	2.5	2.5	3.6	2.1	4.4	4.4
Wisconsin	74	4.1	4.1	2.7	2.7	2.7	4.1	4.1
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	5.8	3.6	4.3	5.0	5.4	6.1	7.6
Hawaii	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	0.0	3.9	3.9	3.9	5.9	3.9	3.9
Washington	74	1.4	1.4	1.4	1.4	2.7	8.1	10.8
Region I	751	2.9	2.0	2.0	2.0	2.4	2.7	2.8
Region II	434	3.9	3.0	3.5	3.9	4.6	5.8	7.1

TABLE 53

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT WITH SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	29.1	33.3	35.1	38.8	37.6	37.0	32.7
Indiana	91	13.2	28.2	26.4	32.8	30.8	31.9	28.6
Michigan	145	25.5	25.3	28.3	30.8	37.2	38.6	39.3
Ohio	276	26.1	26.9	36.6	33.1	46.4	43.8	40.9
Wisconsin	74	29.7	35.9	33.8	41.7	36.5	37.8	32.4
Alaska	4	50.0	25.0	25.0	25.0	25.0	25.0	50.0
California	278	33.5	38.5	39.6	39.6	39.9	40.7	39.2
Hawaii	16	37.5	37.5	37.5	37.5	50.0	50.0	50.0
Nevada	11	27.3	27.3	27.3	27.3	36.4	36.4	27.3
Oregon	51	9.8	33.3	33.3	33.3	27.5	33.3	41.2
Washington	74	28.4	39.2	40.5	41.9	35.1	40.5	37.8
Region I	751	25.4	32.2	33.2	37.4	39.8	39.3	36.5
Region II	434	30.0	37.6	38.5	38.7	37.8	39.9	39.4

TABLE 54
CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT WITH SOCIAL STUDIES AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	7.9	9.7	8.5	8.5	10.3	10.3	11.5
Indiana	91	4.4	9.9	11.0	8.8	9.9	11.0	12.1
Michigan	145	11.7	13.1	12.4	13.8	12.4	12.4	12.4
Ohio	276	8.3	10.5	9.8	10.5	11.6	9.4	7.6
Wisconsin	74	9.5	9.5	9.5	9.5	8.1	8.1	8.1
Alaska	4	25.0	25.0	25.0	25.0	25.0	25.0	25.0
California	278	19.1	20.9	20.1	20.1	21.6	21.2	19.8
Hawaii	16	31.3	31.3	31.3	31.3	25.0	31.3	37.5
Nevada	11	9.1	9.1	9.1	9.1	9.1	9.1	9.1
Oregon	51	3.9	13.7	13.7	15.7	19.6	15.7	17.7
Washington	74	13.5	16.2	16.2	16.2	14.9	12.2	10.8
Region I	751	8.5	10.7	10.1	10.4	10.9	10.3	10.0
Region II	434	16.6	19.4	18.9	19.1	20.1	19.1	18.2

TABLE 55

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT WITH TWO OR MORE SUBJECTS INCLUDING SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	2.0	27.3	29.1	29.1	30.3	30.9	24.2
Indiana	91	19.8	26.4	28.6	33.0	34.1	33.0	29.7
Michigan	145	20.0	27.6	28.3	29.0	29.7	28.3	22.8
Ohio	276	18.1	23.6	23.9	24.6	24.6	23.6	21.0
Wisconsin	74	32.4	35.1	36.5	36.5	36.5	32.4	27.0
Alaska	4	50.0	25.0	25.0	50.0	50.0	50.0	25.0
California	278	25.5	27.0	27.0	26.6	27.7	28.1	26.3
Hawaii	16	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Nevada	11	36.4	36.4	36.4	36.4	36.4	36.4	36.4
Oregon	51	15.7	39.2	39.2	39.2	31.4	31.4	29.4
Washington	74	23.0	31.1	29.7	31.1	32.4	32.4	36.5
Region I	751	20.5	26.6	27.7	28.6	29.2	28.1	23.7
Region II	434	23.5	28.8	28.6	28.8	28.8	29.0	28.1

TABLE 56

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING ENVIRONMENTAL AND/OR CONSERVATION SCIENCE TAUGHT WITH TWO OR MORE SUBJECTS EXCLUDING SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	0.6	0.6	0.6	0.6	0.6	0.6	1.2
Indiana	91	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Michigan	145	1.4	0.7	0.7	0.0	0.0	0.0	0.0
Ohio	276	1.1	1.1	1.1	1.1	1.1	1.1	0.7
Wisconsin	74	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	1.1	1.1	1.1	1.1	0.7	0.7	0.4
Hawaii	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Washington	74	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Region I	751	0.8	0.7	0.7	0.5	0.5	0.5	0.5
Region II	434	0.9	0.9	0.9	0.9	0.5	0.5	0.2

TABLE 57

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING HEALTH TAUGHT WITH ELEMENTARY SCHOOL SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	23.0	29.7	29.7	31.5	32.7	34.6	29.7
Indiana	91	15.4	23.1	23.1	24.2	24.2	24.2	23.1
Michigan	145	31.7	37.2	37.9	39.3	40.0	40.7	37.9
Ohio	276	27.5	36.2	38.0	42.0	44.2	42.4	39.1
Wisconsin	74	32.4	39.2	39.2	37.8	35.1	36.5	35.1
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	14.4	15.1	16.2	16.9	17.3	18.7	20.9
Hawaii	16	31.3	31.3	31.3	31.3	31.3	31.3	31.3
Nevada	11	27.3	27.3	27.3	27.3	27.3	27.3	18.2
Oregon	51	5.9	23.5	27.5	27.5	23.5	23.5	21.6
Washington	74	27.0	29.7	35.1	33.8	35.1	35.1	28.4
Region I	751	26.4	33.7	34.5	36.6	37.7	37.7	34.6
Region II	434	16.4	19.4	21.4	21.7	21.7	22.6	22.4

TABLE 58

CURRICULAR PATTERNS: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING NARCOTICS OR DRUG ABUSE EDUCATION TAUGHT WITH ELEMENTARY SCHOOL SCIENCE AT CERTAIN GRADE LEVELS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	6.1	9.7	9.7	10.3	12.7	18.8	20.0
Indiana	91	2.2	3.3	4.4	6.6	11.0	14.3	16.5
Michigan	145	8.3	9.0	9.0	11.0	15.2	19.3	22.1
Ohio	276	6.2	9.1	9.1	13.8	17.4	19.6	20.3
Wisconsin	74	8.1	8.1	9.5	8.1	9.5	9.5	10.8
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	5.8	7.2	7.2	8.6	11.2	14.0	14.4
Hawaii	16	6.3	6.3	6.3	6.3	18.8	18.8	25.0
Nevada	11	9.1	18.2	18.2	18.2	27.3	36.4	36.4
Oregon	51	17.7	2.0	2.0	3.9	5.9	13.7	15.7
Washington	74	8.1	8.1	8.1	10.8	14.9	16.2	16.2
Region I	751	6.3	8.4	8.7	11.1	14.4	17.7	19.2
Region II	434	5.5	6.9	6.9	8.5	11.8	15.0	15.7

TABLE 59

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A CLASSROOM TEACHER WITH NO HELP FROM AN ELEMENTARY SCIENCE SPECIALIST OR CONSULTANT

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	59.4	67.9	68.5	67.9	64.9	52.7	39.4
Indiana	91	52.8	76.9	79.1	78.0	76.9	65.9	50.6
Michigan	145	67.6	70.3	72.4	70.3	67.6	60.0	43.5
Ohio	276	55.4	65.2	66.7	69.2	63.8	50.7	40.9
Wisconsin	74	71.6	74.3	73.0	68.9	63.5	55.4	44.6
Alaska	4	75.0	100.0	100.0	100.0	75.0	75.0	25.0
California	278	67.3	69.8	69.8	66.6	61.2	56.8	50.7
Hawaii	16	68.8	62.5	56.3	56.3	43.8	37.5	37.5
Nevada	11	72.7	72.7	72.7	81.8	90.9	72.7	54.6
Oregon	51	27.5	72.6	72.6	72.6	66.7	56.9	56.9
Washington	74	58.1	64.9	66.2	63.5	62.2	56.8	47.3
Region I	751	59.9	69.1	70.3	70.2	66.3	55.3	42.6
Region II	434	61.3	69.4	69.4	67.1	62.2	56.7	50.2

TABLE 60

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A REGULAR CLASSROOM TEACHER WHO TEACHES SCIENCE CLASSES FOR OTHER TEACHERS

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	0.0	1.2	1.2	2.4	8.5	15.8	15.8
Indiana	91	0.0	0.0	1.1	1.1	4.4	12.1	17.6
Michigan	145	1.4	2.8	3.5	4.8	9.0	12.4	19.3
Ohio	276	0.4	1.8	1.5	1.5	6.2	17.0	21.4
Wisconsin	74	1.4	2.7	4.1	6.8	14.9	17.6	20.3
Alaska	4	0.0	0.0	0.0	0.0	25.0	0.0	50.0
California	278	1.8	2.9	2.9	3.2	7.6	15.1	14.8
Hawaii	16	0.0	6.3	6.3	6.3	18.8	25.0	25.0
Nevada	11	0.0	0.0	0.0	0.0	18.2	27.3	27.3
Oregon	51	0.0	0.0	0.0	2.0	5.9	13.7	17.7
Washington	74	0.0	1.4	1.4	2.7	1.4	10.8	16.2
Region I	751	0.5	1.7	2.0	2.8	7.9	15.3	19.2
Region II	434	1.2	2.3	2.3	3.0	7.1	14.8	16.4

TABLE 61

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A SPECIAL SCIENCE TEACHER ON THE SCHOOL STAFF

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	0.0	0.0	0.0	0.0	2.4	6.7	15.2
Indiana	91	0.0	0.0	0.0	0.0	2.2	7.7	12.1
Michigan	145	1.4	1.4	4.1	7.6	9.0	12.4	15.2
Ohio	276	1.1	1.1	1.1	1.8	5.1	7.6	9.8
Wisconsin	74	1.4	1.4	1.4	1.4	1.4	4.1	9.5
Alaska	4	0.0	0.0	0.0	0.0	0.0	25.0	25.0
California	278	0.4	1.8	2.5	1.8	2.2	3.6	7.9
Hawaii	16	0.0	0.0	0.0	0.0	18.8	18.8	18.8
Nevada	11	0.0	0.0	0.0	0.0	9.1	9.1	18.2
Oregon	51	0.0	0.0	2.0	2.0	2.0	2.0	2.0
Washington	74	0.0	1.4	2.7	4.1	5.4	6.8	6.8
Region I	751	0.8	0.8	1.3	2.3	4.5	8.0	12.3
Region II	434	0.2	1.4	2.3	2.1	3.5	4.8	7.8

TABLE 62

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A SPECIAL SCIENCE TEACHER FROM THE CENTRAL OFFICE STAFF

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	0.0	0.6	0.6	0.6	0.6	0.6	0.6
Indiana	91	0.0	1.1	1.1	1.1	1.1	1.1	1.1
Michigan	145	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ohio	276	0.0	0.4	0.4	0.4	0.4	0.4	0.4
Wisconsin	74	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	0.7	1.1	1.1	2.2	1.8	1.8	1.4
Hawaii	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Washington	74	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Region I	751	0.1	0.5	0.5	0.5	0.5	0.5	0.5
Region II	434	0.5	0.7	0.7	1.4	1.2	1.2	0.9

TABLE 63

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A CLASSROOM TEACHER WITH HELP OF ELEMENTARY SCIENCE SPECIALIST OR CONSULTANT ON SCHOOL STAFF

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	3.0	2.4	2.4	3.0	3.0	3.0	3.0
Indiana	91	4.4	4.4	4.4	4.4	4.4	2.2	1.1
Michigan	145	8.3	6.9	6.9	4.8	2.8	2.1	2.1
Ohio	276	7.6	8.3	8.3	8.3	8.3	6.2	5.1
Wisconsin	74	1.4	2.7	2.7	2.7	1.4	1.4	2.7
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	2.2	1.1	1.1	1.4	2.2	2.9	3.2
Hawaii	16	6.3	6.3	6.3	6.3	0.0	0.0	0.0
Nevada	11	9.1	9.1	9.1	9.1	0.0	0.0	0.0
Oregon	51	3.9	11.8	13.7	13.7	13.7	11.8	11.8
Washington	74	5.4	4.1	5.4	4.1	6.8	6.8	5.4
Region I	751	5.7	5.7	5.7	5.5	4.9	3.7	3.3
Region II	434	3.2	3.2	3.7	3.7	4.2	4.4	4.4

TABLE 64

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH SCIENCE WAS TAUGHT BY A CLASSROOM TEACHER WITH HELP OF ELEMENTARY SCIENCE SPECIALIST OR CONSULTANT FROM THE CENTRAL OFFICE STAFF

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	12.7	15.2	15.2	14.6	13.3	12.7	10.3
Indiana	91	3.3	5.5	5.5	5.5	4.4	3.3	3.3
Michigan	145	9.7	10.3	10.3	10.3	9.7	7.6	7.6
Ohio	276	8.0	9.1	9.1	9.1	8.7	7.6	6.5
Wisconsin	74	13.5	13.5	13.5	14.9	14.9	12.2	10.8
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	11.9	12.2	12.2	12.6	11.5	11.5	9.4
Hawaii	16	18.8	18.8	18.8	18.8	18.8	18.8	18.8
Nevada	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	51	3.9	11.8	11.8	11.8	11.8	13.7	13.7
Washington	74	14.9	20.3	20.3	20.3	20.3	18.9	17.6
Region I	751	9.3	10.7	10.7	10.7	10.0	8.7	7.6
Region II	434	11.3	13.4	13.4	13.6	12.9	12.9	11.3

TABLE 65

PATTERNS OF SCIENCE TEACHING: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN GRADE LEVELS AT WHICH EDUCATIONAL TELEVISION SCIENCE PROGRAMS WERE USED

State & Region	Sample Size	Grade Level						
		Kindergarten	First	Second	Third	Fourth	Fifth	Sixth
Illinois	165	13.9	20.6	20.6	21.8	24.9	22.4	19.4
Indiana	91	9.9	12.1	12.1	13.2	15.4	19.8	7.7
Michigan	145	15.2	17.9	20.0	23.5	21.4	17.2	15.9
Ohio	276	20.3	27.2	27.9	28.3	29.4	28.3	25.0
Wisconsin	74	9.5	24.3	24.3	29.7	32.4	28.4	27.0
Alaska	4	25.0	50.0	50.0	25.0	25.0	25.0	25.0
California	278	25.2	30.2	30.9	34.5	35.3	34.9	32.0
Hawaii	16	31.3	43.8	43.8	81.3	68.8	75.0	43.8
Nevada	11	54.6	72.7	72.7	90.9	90.9	90.9	72.7
Oregon	51	11.8	39.2	41.2	39.2	33.3	31.4	29.4
Washington	74	32.4	47.3	47.3	47.3	47.3	46.0	41.9
Region I	751	15.6	21.8	22.5	24.2	25.4	23.8	20.1
Region II	434	25.8	35.9	36.6	40.3	39.6	39.2	34.8

TABLE 66
CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN TEACHING ROLES WITH SELECTED SCIENCE CLASS

State & Region	Sample Size	Science Teaching Role							
		Classroom teacher with no specialist or consultant help	Classroom teacher who teaches classes for other teachers	Classroom teacher with help of specialist or consultant on school staff	Classroom teacher with help of specialist or consultant from central office	Special science teacher on school staff	Special science teacher from central office	Classroom teacher who coordinates instruction with educational television	Other roles and Non-response
Illinois	158	58.2	16.5	1.9	8.2	10.8	0.0	1.3	3.2
Indiana	91	62.6	14.3	2.2	9.9	3.3	0.0	1.1	6.6
Michigan	131	45.8	16.0	1.5	4.6	14.5	0.0	11.5	6.1
Ohio	275	56.7	16.4	1.5	7.3	10.2	0.7	3.3	4.0
Wisconsin	68	48.5	17.7	7.4	11.8	8.8	0.0	4.4	1.5
Alaska	5	40.0	20.0	0.0	0.0	20.0	0.0	0.0	20.0
California	260	60.0	15.8	1.2	4.6	10.8	0.0	3.5	4.2
Hawaii	17	29.4	11.8	0.0	17.7	17.7	0.0	11.8	11.8
Nevada	10	60.0	10.0	0.0	0.0	10.0	0.0	10.0	10.0
Oregon	42	47.6	14.3	0.0	16.7	11.9	0.0	4.8	4.8
Washington	69	56.5	13.0	1.5	13.0	4.4	1.5	7.3	2.9
Region I	723	55.1	16.3	2.1	7.8	10.4	0.3	4.1	3.9
Region II	403	56.8	14.9	1.0	7.7	10.2	0.3	4.7	4.5

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[a] Percentages may not equal 100 due to rounding.

TABLE 67
PATTERNS OF SCIENCE TEACHING: PERCENT OF TEACHERS BY STATE REPORTING USE OF CERTAIN SCIENCE TEACHING PATTERNS WITH SELECTED SCIENCE CLASS

State & Region	Sample Size	Separate Subject	Integrated with Other Subject	Incidentally	Separate and Incidental	Integrated and Incidental	Other Patterns	Non-Response
Illinois	158	59.5	7.6	0.0	18.4	7.6	5.1	1.9
Indiana	91	37.4	7.7	1.1	37.4	11.0	3.3	2.2
Michigan	131	55.0	4.6	0.0	27.5	9.2	1.5	2.3
Ohio	275	54.9	10.6	0.4	19.6	8.4	2.9	3.3
Wisconsin	68	64.7	10.3	0.0	17.7	2.9	4.4	0.0
Alaska	5	80.0	20.0	0.0	0.0	0.0	0.0	0.0
California	260	50.0	15.4	0.8	21.5	6.5	3.1	2.7
Hawaii	17	47.1	11.8	0.0	23.5	5.9	11.8	0.0
Nevada	10	60.0	0.0	0.0	20.0	0.0	10.0	10.0
Oregon	42	40.5	4.8	0.0	26.2	7.1	19.1	2.4
Washington	69	44.9	5.8	0.0	37.7	10.1	0.0	1.5
Region I	723	55.1	8.0	0.3	23.1	8.2	3.3	1.9
Region II	403	48.4	12.4	0.5	24.6	7.0	4.7	2.5

TABLE 68
PATTERN OF SCIENCE TEACHING: PERCENT OF TEACHER RESPONDENTS BY REGION RANKING USAGE OF CERTAIN LEARNING ACTIVITIES WITH SELECTED SCIENCE CLASS[a]

Learning Activity	Region I: Central States Rank of Learning Activity				Region II: Far West States Rank of Learning Activity			
	Most Often Used	Second Most Used	Third Most Used	Used	Most Often Used	Second Most Used	Third Most Used	Used
Lecture	2.4	3.7	4.9	16.2	2.5	2.7	5.2	20.1
Individual Laboratory Activities	4.2	5.3	6.0	15.0	6.2	6.0	5.5	26.1
Lecture Discussion	54.9	11.5	7.6	6.8	44.4	14.1	8.4	12.4
Group Laboratory Activity	9.3	14.5	11.5	14.8	11.2	15.9	8.2	24.1
Small Group Discussion	5.3	8.5	6.9	19.8	4.7	7.9	7.7	26.3
In-Class Written Assignments	1.9	6.8	8.5	24.2	4.2	7.7	9.9	28.5
Science Demonstrations	11.4	31.9	17.9	13.6	12.4	22.3	20.4	23.1

TABLE 68, cont.

Learning Activity	Region I: Central States Rank of Learning Activity				Region II: Far West States Rank of Learning Activity			
	Most Often Used	Second Most Used	Third Most Used	Used	Most Often Used	Second Most Used	Third Most Used	Used
Excursions or Field Trips	0.8	1.8	5.0	21.5	1.7	2.2	7.2	32.5
Instructional Films	3.1	15.0	18.4	24.2	4.0	17.9	18.1	33.8
Programmed Instruction	1.1	0.8	3.1	4.3	2.2	0.7	3.5	7.4
Independent Study	5.4	6.0	9.7	22.4	8.2	8.2	12.7	30.3
Auto-tutorial Instruction	0.3	0.3	1.9	2.9	0.5	0.7	2.5	3.0
Televised Instruction	1.9	2.6	3.2	7.1	4.7	2.0	3.7	14.6
Other Activities	1.3	0.8	0.8	2.4	1.0	0.5	0.7	2.5

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[a] Percentages do not equal 100 since respondents report different activities used.

TABLE 69

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING AVAILABILITY WITHIN THE SCHOOL SYSTEM OF CONSULTANT OR SUPERVISORY HELP IN TEACHING SCIENCE[a]

		Availability of Help		
State & Region	Sample Size	Supervisory or Consultant Help Available	Supervisory or Consultant Help Not Available	Non-Response
Illinois	165	48.5	51.5	0.0
Indiana	91	46.2	51.7	2.2
Michigan	145	44.1	53.8	1.4
Ohio	276	54.4	43.8	1.8
Wisconsin	74	59.5	39.2	1.4
Alaska	4	25.0	75.0	0.0
California	278	57.2	40.7	2.2
Hawaii	16	56.3	43.8	0.0
Nevada	11	45.5	54.6	0.0
Oregon	51	47.1	52.9	0.0
Washington	74	56.8	40.5	2.7
Region I	751	50.6	47.9	1.3
Region II	434	55.3	42.9	1.8

[a] Percentages may not equal 100 due to rounding.

TABLE 70

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN TYPES OF CONSULTANT OR SUPERVISORY HELP AVAILABLE WITHIN THE SCHOOL SYSTEM

		Type of Consultant or Supervisory Help					
State & Region	Sample Size	General Elementary Supervisor with only General Knowledge of Science	General Elementary Supervisory with Special Competence in Science	Elementary Science Consultant, Supervisor or Specialist	Classroom Teacher with Special Training or Competence in Science	High School Science Teacher	Other Types of Consultant or Supervisory Help
Illinois	165	4.2	7.3	16.4	13.3	7.3	8.5
Indiana	91	17.6	5.5	12.1	9.9	16.5	7.7
Michigan	145	4.1	6.9	17.2	13.1	13.8	5.5
Ohio	276	21.4	9.1	13.4	8.3	12.3	7.6
Wisconsin	74	17.6	4.1	20.3	21.6	16.2	10.8
Alaska	4	0.0	0.0	0.0	25.0	0.0	0.0
California	278	15.8	11.2	15.8	11.9	5.8	7.2
Hawaii	16	12.5	6.3	37.5	0.0	6.3	25.0
Nevada	11	9.1	0.0	9.1	36.4	18.2	0.0
Oregon	51	3.9	5.9	21.6	15.7	9.8	7.8
Washington	74	10.8	6.8	23.0	14.9	16.2	2.7
Region I	751	13.5	7.3	15.3	9.9	12.4	7.7
Region II	434	13.1	9.2	18.2	12.9	8.5	6.9

TABLE 71
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY KINDERGARTEN TEACHERS[a]

State & Region	Sample Size	Extent of Usage			Non-Response and no Kindergarten
		Rarely or Never (Less than once a month)	Occasionally (About once a month)	Very often (At least once a week)	
Illinois	165	31.5	4.2	0.6	63.6
Indiana	91	25.3	4.4	2.2	68.1
Michigan	145	25.5	8.3	0.7	65.5
Ohio	276	33.0	6.9	0.4	59.8
Wisconsin	74	31.1	14.9	0.0	54.1
Alaska	4	25.0	0.0	0.0	75.0
California	278	41.0	5.0	0.4	53.6
Hawaii	16	25.0	18.8	0.0	56.3
Nevada	11	36.4	9.1	0.0	54.6
Oregon	51	9.8	3.9	0.0	86.3
Washington	74	32.4	8.1	1.4	58.1
Region I	751	30.1	7.1	0.7	62.2
Region II	434	35.0	6.0	0.5	58.5

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[a] Percentages may not equal 100 due to rounding.

TABLE 72
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE ONE TEACHERS[a]

State & Region	Sample Size	Extent of Usage			Non-Response and no Grade One
		Rarely or Never (Less than once a month)	Occasionally (About once a month)	Very Often (At least once a week)	
Illinois	165	29.7	8.5	1.2	60.6
Indiana	91	30.8	6.6	2.2	60.4
Michigan	145	24.8	9.7	1.4	64.1
Ohio	276	36.6	8.3	0.4	54.7
Wisconsin	74	31.1	16.2	0.0	52.7
Alaska	4	25.0	0.0	0.0	75.0
California	278	39.6	6.5	1.1	52.9
Hawaii	16	25.0	18.8	0.0	56.3
Nevada	11	36.4	0.0	9.1	54.6
Oregon	51	27.5	9.8	3.9	58.8
Washington	74	35.1	13.5	0.0	51.4
Region I	751	31.6	9.2	0.9	58.3
Region II	434	36.6	8.3	1.4	53.7

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[a] Percentages may not equal 100 due to rounding.

TABLE 73

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE TWO TEACHERS[a]

State & Region	Sample Size	Rarely or Never (Less than once a month)	Occasionally (About once a month)	Very Often (At least once a week)	Non-Response and no Grade Two
Illinois	165	29.7	8.5	1.2	60.6
Indiana	91	29.7	11.0	1.1	58.2
Michigan	145	24.8	10.3	1.4	63.5
Ohio	276	34.4	10.5	0.4	54.7
Wisconsin	74	29.7	17.6	0.0	52.7
Alaska	4	25.0	0.0	0.0	75.0
California	278	38.5	7.2	1.4	52.9
Hawaii	16	31.3	18.8	0.0	50.0
Nevada	11	27.3	9.1	9.1	54.6
Oregon	51	25.5	11.8	3.9	58.8
Washington	74	35.1	14.9	0.0	50.0
Region I	751	30.5	10.8	0.8	57.9
Region II	434	35.7	9.5	1.6	53.2

[a] Percentages may not equal 100 due to rounding.

TABLE 74
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE THREE TEACHERS[a]

State & Region	Sample Size	Extent of Usage: Rarely or Never (Less than once a month)	Extent of Usage: Occasionally (About once a month)	Extent of Usage: Very Often (At least once a week)	Non-Response and no Grade Three
Illinois	165	28.5	9.1	1.2	61.2
Indiana	91	29.7	12.1	1.1	57.1
Michigan	145	27.6	9.0	1.4	62.1
Ohio	276	34.8	10.1	1.1	54.0
Wisconsin	74	24.3	23.0	1.4	51.4
Alaska	4	25.0	0.0	0.0	75.0
California	278	37.8	9.4	0.4	52.5
Hawaii	16	37.5	6.3	6.3	50.0
Nevada	11	36.4	0.0	9.1	54.6
Oregon	51	23.5	13.7	3.9	58.8
Washington	74	35.1	14.9	0.0	50.0
Region I	751	30.4	11.2	1.2	57.3
Region II	434	35.5	10.4	1.2	53.0

[a] Percentages may not equal 100 due to rounding.

TABLE 75

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE FOUR TEACHERS[a]

State & Region	Sample Size	Extent of Usage			Non-Response and no Grade Four
		Rarely or Never (Less than once a month)	Occasionally (About once a month)	Very Often (At least once a week)	
Illinois	165	23.6	13.3	2.4	60.6
Indiana	91	28.6	9.9	3.3	58.2
Michigan	145	22.8	12.4	2.1	62.8
Ohio	276	32.3	13.8	1.1	52.9
Wisconsin	74	24.3	23.0	2.7	50.0
Alaska	4	25.0	0.0	0.0	75.0
California	278	34.2	13.0	0.4	52.5
Hawaii	16	31.3	12.5	18.8	37.5
Nevada	11	27.3	9.1	9.1	54.6
Oregon	51	17.7	17.7	2.0	62.8
Washington	74	32.4	14.9	2.7	50.0
Region I	751	27.3	13.9	2.0	56.9
Region II	434	31.6	13.6	1.8	53.0

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[a] Percentages may not equal 100 due to rounding.

TABLE 76

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE FIVE TEACHERS[a]

State & Region	Sample Size	Extent of Usage Rarely or Never (Less than once a month)	Extent of Usage Occasionally (About once a month)	Extent of Usage Very Often (At least once a week)	Non-Response and no Grade Five
Illinois	165	21.8	16.4	1.2	60.6
Indiana	91	26.4	11.0	4.4	58.2
Michigan	145	23.5	12.4	2.8	61.4
Ohio	276	30.1	13.8	1.5	54.7
Wisconsin	74	20.3	20.3	4.1	55.4
Alaska	4	25.0	0.0	0.0	75.0
California	278	33.8	12.2	1.8	52.2
Hawaii	16	31.3	12.5	18.8	37.5
Nevada	11	27.3	9.1	9.1	54.6
Oregon	51	19.6	17.7	2.0	60.8
Washington	74	27.0	17.6	5.4	50.0
Region I	751	25.6	14.4	2.3	57.8
Region II	434	30.7	13.6	3.2	52.5

[a] Percentages may not equal 100 due to rounding.

TABLE 77

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING CERTAIN USAGE OF CONSULTANT HELP IN SCIENCE BY GRADE SIX TEACHERS [a]

State & Region	Sample Size	Extent of Usage			Non-Response and no Grade Six
		Rarely or Never (Less than once a month)	Occasionally (About once a month)	Very Often (At least once a week)	
Illinois	165	19.4	12.1	2.4	66.1
Indiana	91	20.9	11.0	2.2	65.9
Michigan	145	21.4	11.0	4.1	63.5
Ohio	276	27.5	11.2	1.5	59.8
Wisconsin	74	13.5	21.6	4.1	60.8
Alaska	4	25.0	0.0	0.0	75.0
California	278	32.4	10.8	1.8	55.0
Hawaii	16	25.0	12.5	18.8	43.8
Nevada	11	27.3	0.0	9.1	63.6
Oregon	51	19.6	15.7	3.9	60.8
Washington	74	25.7	17.6	4.1	52.7
Region I	751	22.4	12.4	2.5	62.7
Region II	434	29.3	12.2	3.2	55.3

[a] Percentages may not equal 100 due to rounding.

TABLE 78
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--PLANNING OR CONSULTING WITH TEACHERS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	21.2	7.3	1.8	17.6	10.3	4.2	11.5	16.4	7.3
Indiana	91	8.8	5.5	2.2	11.0	12.1	3.3	12.1	12.1	3.3
Michigan	145	17.9	9.7	0.7	12.4	18.6	1.4	13.1	15.9	2.8
Ohio	276	19.2	12.0	1.1	18.1	17.8	2.2	14.1	21.4	4.0
Wisconsin	74	18.9	17.6	1.4	14.9	24.3	1.4	12.1	24.3	5.4
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	23.7	11.5	0.4	19.8	16.2	0.7	17.3	18.4	1.8
Hawaii	16	18.8	6.3	6.3	12.5	6.3	6.3	12.5	6.3	12.5
Nevada	11	27.3	9.1	0.0	18.2	9.1	9.1	18.2	9.1	9.1
Oregon	51	5.9	2.0	2.0	13.7	15.7	2.0	9.8	21.6	0.0
Washington	74	14.9	12.2	2.7	14.9	20.3	2.7	8.1	18.9	8.1
Region I	751	18.1	10.3	1.3	15.7	16.2	2.5	12.9	18.4	4.5
Region II	434	19.8	10.1	1.2	17.7	16.1	1.6	14.5	18.0	3.2

TABLE 79

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--TEACHING SCIENCE LESSONS WITHIN CLASSROOMS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	27.3	2.4	0.0	26.7	4.2	1.2	26.1	8.5	0.6
Indiana	91	11.0	3.3	1.1	16.5	5.5	1.1	17.6	6.6	0.0
Michigan	145	22.1	2.1	0.7	22.8	4.8	0.7	21.4	8.3	0.0
Ohio	276	26.8	3.3	0.7	30.1	5.1	1.8	25.7	10.5	1.1
Wisconsin	74	31.1	2.7	2.7	32.4	5.4	2.7	28.4	8.1	4.1
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	28.4	3.2	0.7	26.3	6.5	0.7	25.5	6.5	1.8
Hawaii	16	18.8	12.5	0.0	6.3	18.8	0.0	12.5	6.3	12.5
Nevada	11	18.2	0.0	0.0	9.1	0.0	0.0	9.1	0.0	0.0
Oregon	51	9.8	0.0	0.0	23.5	3.9	2.0	21.6	9.8	0.0
Washington	74	28.4	0.0	0.0	28.4	6.8	1.4	25.7	6.8	2.7
Region I	751	24.5	2.8	0.8	26.5	4.9	1.5	24.2	8.9	0.9
Region II	434	25.4	2.5	0.5	24.9	6.5	0.9	24.0	6.7	2.1

TABLE 80

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--INTRODUCING SCIENCE UNITS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	24.9	4.2	0.6	25.5	4.2	2.4	26.1	6.1	3.0
Indiana	91	12.1	2.2	1.1	16.5	4.4	1.1	16.5	7.7	0.0
Michigan	145	22.1	2.1	0.0	22.1	4.8	0.0	21.4	6.9	0.0
Ohio	276	26.5	4.0	0.0	30.4	5.4	0.7	28.3	8.7	0.4
Wisconsin	74	28.4	8.1	0.0	24.3	14.9	1.4	25.7	10.8	2.7
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	26.6	4.3	1.1	26.3	5.4	1.1	25.2	7.2	1.4
Hawaii	16	18.8	12.5	0.0	6.3	18.8	0.0	12.5	12.5	6.3
Nevada	11	18.2	9.1	0.0	9.1	0.0	9.1	9.1	9.1	9.1
Oregon	51	9.8	0.0	0.0	23.5	5.9	0.0	25.5	5.9	0.0
Washington	74	24.3	1.4	0.0	25.7	9.5	0.0	21.6	10.8	1.4
Region I	751	23.7	3.9	0.3	25.4	5.9	1.1	24.8	7.9	1.1
Region II	434	23.5	3.7	0.7	24.4	6.5	0.9	23.5	7.8	1.6

TABLE 81
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--PROVIDING MATERIALS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	16.4	12.1	2.4	12.1	17.0	4.9	8.5	18.8	9.1
Indiana	91	6.6	7.7	3.3	3.3	13.2	7.7	2.2	16.5	7.7
Michigan	145	11.7	8.3	5.5	10.3	13.1	8.3	9.0	13.8	8.3
Ohio	276	13.0	14.5	3.6	13.4	18.5	6.2	10.1	20.3	8.0
Wisconsin	74	12.2	20.3	4.1	8.1	24.3	8.1	4.1	23.0	14.9
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	17.3	11.2	5.0	14.8	15.1	5.4	12.2	18.0	5.8
Hawaii	16	18.8	12.5	0.0	12.5	12.5	0.0	12.5	12.5	12.5
Nevada	11	18.2	9.1	0.0	9.1	9.1	9.1	9.1	9.1	9.1
Oregon	51	5.9	2.0	3.9	13.7	7.8	9.8	11.8	11.8	9.8
Washington	74	8.1	13.5	5.4	9.5	16.2	8.1	5.4	17.6	10.8
Region I	751	12.7	12.5	3.7	10.8	17.0	6.7	8.0	18.5	8.9
Region II	434	14.3	10.4	4.6	13.4	14.1	6.2	10.8	16.6	7.4

TABLE 82
INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--PLANNING FIELD TRIPS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	27.9	3.0	0.0	26.7	3.6	2.4	27.9	4.9	1.8
Indiana	91	8.8	5.5	1.1	13.2	6.6	2.2	13.2	7.7	2.2
Michigan	145	20.7	4.1	0.7	23.5	4.1	1.4	22.1	3.5	2.1
Ohio	276	25.0	4.7	0.7	27.5	8.0	1.5	25.4	10.5	1.8
Wisconsin	74	28.4	6.8	1.4	21.6	16.2	2.7	18.9	17.6	2.7
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	26.3	5.0	1.4	25.2	6.1	2.2	24.5	7.2	3.2
Hawaii	16	25.0	6.3	0.0	18.8	6.3	0.0	18.8	6.3	0.0
Nevada	11	18.2	9.1	0.0	9.1	0.0	9.1	9.1	0.0	9.1
Oregon	51	9.8	0.0	0.0	17.7	11.8	0.0	19.6	11.8	0.0
Washington	74	21.6	4.1	0.0	21.6	9.5	1.4	18.9	9.5	2.7
Region I	751	23.2	4.5	0.7	24.2	6.9	1.9	23.2	8.3	2.0
Region II	434	23.0	4.4	0.9	22.8	7.1	1.8	21.9	7.8	2.8

TABLE 83

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP-- EVALUATION OF SCIENCE TEACHING

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	27.9	1.8	0.6	27.9	3.6	0.6	27.3	6.1	1.2
Indiana	91	12.1	3.3	0.0	16.5	5.5	0.0	17.6	5.5	0.0
Michigan	145	20.7	4.1	0.0	20.7	6.9	0.0	21.4	8.3	0.0
Ohio	276	24.6	5.4	0.4	28.3	6.5	1.5	27.5	8.0	1.5
Wisconsin	74	33.8	2.7	1.4	31.3	8.1	1.4	27.0	10.8	2.7
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	30.2	1.8	0.4	29.2	3.6	0.4	29.5	4.3	0.7
Hawaii	16	31.3	0.0	0.0	25.0	0.0	0.0	25.0	0.0	0.0
Nevada	11	18.2	9.1	0.0	9.1	0.0	9.1	9.1	0.0	9.1
Oregon	51	9.8	0.0	0.0	23.5	5.9	0.0	25.5	5.9	0.0
Washington	74	25.7	0.0	0.0	27.0	4.1	1.4	25.7	2.7	2.7
Region I	751	24.0	3.9	0.4	25.6	6.0	0.8	25.0	7.6	1.1
Region II	434	26.3	1.4	0.2	27.4	3.7	0.7	27.2	3.9	1.2

TABLE 84

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--DEMONSTRATION TEACHING BEFORE TEACHER GROUPS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	25.5	4.9	0.6	23.0	7.3	2.4	24.2	7.9	3.0
Indiana	91	13.2	2.2	1.1	17.6	3.3	1.1	17.6	5.5	1.1
Michigan	145	21.4	3.5	0.7	20.7	6.9	1.4	20.0	6.9	1.4
Ohio	276	24.3	5.8	0.4	28.6	6.5	1.5	25.7	10.1	0.7
Wisconsin	74	29.7	5.4	1.4	28.4	12.2	1.4	27.0	12.2	1.4
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	25.5	5.8	1.8	24.1	8.3	1.4	23.0	9.7	1.4
Hawaii	16	31.3	0.0	0.0	18.8	6.3	0.0	18.8	0.0	12.5
Nevada	11	18.2	9.1	0.0	9.1	9.1	0.0	9.1	9.1	0.0
Oregon	51	9.8	0.0	0.0	25.5	3.9	2.0	19.6	9.8	2.0
Washington	74	16.2	8.1	0.0	18.9	13.5	1.4	17.6	12.2	4.1
Region I	751	23.2	4.7	0.7	24.5	6.9	1.6	23.4	8.7	1.5
Region II	434	21.9	5.1	1.2	22.6	8.3	1.4	21.0	9.5	2.3

TABLE 85

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING
EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP--
ORGANIZING OR DIRECTING TEACHER WORKSHOPS

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	18.2	9.7	3.0	14.6	13.3	4.9	16.4	13.9	4.9
Indiana	91	8.8	4.4	3.3	12.1	5.5	4.4	12.1	6.6	4.4
Michigan	145	15.9	7.6	1.4	16.6	10.3	1.4	17.2	9.7	1.4
Ohio	276	18.8	9.8	2.5	20.3	13.8	3.6	18.8	15.6	4.0
Wisconsin	74	14.9	21.6	1.4	14.9	24.3	2.7	14.9	20.3	4.1
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	19.8	10.4	4.0	18.7	13.7	3.6	15.8	17.3	3.6
Hawaii	16	25.0	0.0	0.0	18.8	0.0	0.0	18.8	0.0	0.0
Nevada	11	18.2	18.2	0.0	9.1	18.2	0.0	9.1	18.2	9.1
Oregon	51	7.8	2.0	0.0	23.5	3.9	3.9	21.6	7.8	3.9
Washington	74	6.8	13.5	5.4	13.5	12.2	8.1	9.5	13.5	9.5
Region I	751	16.5	9.9	2.4	16.8	13.1	3.5	16.8	13.5	3.7
Region II	434	16.1	9.7	3.5	18.0	11.8	4.2	15.2	14.8	4.6

TABLE 86

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING EXTENT OF USAGE AT CERTAIN GRADE LEVEL GROUPS OF CONSULTANT HELP-- WORKING WITH SMALL GROUPS OF CHILDREN

State & Region	Sample Size	Kindergarten			Grades One, Two and Three			Grades Four, Five and Six		
		Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often	Rarely	Occasionally	Very Often
Illinois	165	26.7	1.8	0.6	27.3	2.4	2.4	29.1	1.8	3.0
Indiana	91	9.9	4.4	0.0	16.5	3.3	0.0	17.6	3.3	0.0
Michigan	145	21.4	2.8	0.0	22.1	4.1	0.0	22.1	4.1	0.7
Ohio	276	25.0	4.4	0.4	28.3	5.8	1.5	27.2	7.3	1.5
Wisconsin	74	31.1	4.1	1.4	33.8	6.8	0.0	33.8	6.8	1.4
Alaska	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California	278	28.1	3.6	0.7	27.0	5.0	0.7	26.6	4.7	1.8
Hawaii	16	31.3	0.0	0.0	25.0	0.0	0.0	25.0	0.0	6.3
Nevada	11	18.2	9.1	0.0	9.1	9.1	0.0	9.1	9.1	0.0
Oregon	51	9.8	2.0	0.0	21.6	7.8	0.0	23.5	7.8	0.0
Washington	74	17.6	5.4	0.0	18.9	9.5	0.0	16.2	10.8	1.4
Region I	751	23.4	3.5	0.4	26.0	4.5	1.1	26.1	4.9	1.5
Region II	434	23.7	3.7	0.5	24.2	5.0	0.5	23.7	6.0	1.6

TABLE 87

INSERVICE EDUCATION: PERCENT OF PRINCIPALS BY STATE AND REGION REPORTING OPPORTUNITIES FOR CERTAIN INSERVICE SCIENCE EDUCATION ACTIVITIES AVAILABLE

		Inservice Science Education Activity						
State & Region	Sample Size	Teachers' Meetings	Curriculum Development and Revision	Elementary Science Courses	Elementary Science Workshops	Visitations and Demonstration Teaching	Television and Radio Programs	Other In-Service Activities
Illinois	165	76.4	78.8	59.1	81.2	60.0	43.6	3.0
Indiana	91	76.9	72.5	51.7	67.0	38.5	26.4	3.0
Michigan	145	79.3	76.6	65.5	67.6	56.6	49.7	9.0
Ohio	276	79.4	79.0	52.5	64.1	53.6	48.2	5.8
Wisconsin	74	91.9	89.2	83.8	77.0	60.8	60.8	6.8
Alaska	4	50.0	50.0	50.0	75.0	50.0	50.0	25.0
California	278	74.1	68.0	82.0	79.1	54.7	67.3	6.1
Hawaii	16	81.3	68.8	81.3	87.5	56.3	87.5	0.0
Nevada	11	81.8	72.7	72.7	54.6	27.3	90.9	0.0
Oregon	51	82.4	72.6	82.4	84.3	52.9	66.7	7.8
Washington	74	75.7	70.3	73.0	75.7	48.7	59.5	2.7
Region I	751	79.6	78.7	61.7	70.2	54.5	46.1	5.6
Region II	434	75.6	68.9	80.2	79.0	52.8	67.3	5.5

TABLE 88

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE ATTENDING VARIOUS SPONSORED IN-SERVICE SCIENCE ACTIVITIES SINCE SEPTEMBER 1968

State & Region	Sample Size	Teachers' Meetings	Curriculum Development and Revision	Elementary Science Courses	Elementary Science Workshops	Visitations and Demonstration Teaching	Television and Radio Programs	Other In-Service Activities
Illinois	158	34.8	26.6	12.0	31.7	24.1	11.4	12.7
Indiana	91	35.2	24.2	13.2	22.0	18.7	6.6	5.5
Michigan	131	31.3	27.5	16.0	26.7	20.6	7.6	13.0
Ohio	275	36.4	25.1	10.2	29.5	21.5	16.0	11.3
Wisconsin	68	36.8	32.4	22.1	35.3	23.5	11.8	13.2
Alaska	5	20.0	60.0	40.0	40.0	40.0	20.0	20.0
California	260	30.0	18.9	18.9	33.5	14.6	11.5	11.5
Hawaii	17	23.5	17.7	23.5	58.8	23.5	23.5	29.4
Nevada	10	20.0	20.0	10.0	40.0	10.0	20.0	10.0
Oregon	42	52.4	35.7	35.7	40.5	26.2	19.1	19.1
Washington	69	24.6	20.3	15.9	36.2	13.0	18.8	8.7
Region I	723	35.0	26.3	13.0	29.2	21.9	11.8	11.4
Region II	403	30.8	21.3	20.1	35.7	16.1	14.1	12.4

TABLE 89
BARRIERS TO EFFECTIVE SCIENCE TEACHING: PERCENT OF TEACHERS BY REGION REPORTING DEGREE OF DIFFICULTY CERTAIN FACTORS OFFER TO EFFECTIVE SCIENCE TEACHING

	Region I			Region II		
	No Difficulty	Some Difficulty	Great Difficulty	No Difficulty	Some Difficulty	Great Difficulty
Inadequate Room Facilities	27.4	48.9	23.0	29.0	48.[illegible]	22.1
Lack of Supplies and Equipment	28.5	51.7	19.0	29.8	53.9	16.1
Insufficient Funds for Purchasing Needed Supplies, Equipment and Appropriate Reading Materials	26.2	45.7	26.2	23.3	46.9	29.0
Lack of community support for science program	60.0	28.0	7.8	58.6	30.0	7.7
Inability of teachers to improvise materials and equipment	39.8	48.2	9.3	37.2	47.2	13.4
Teachers do not have sufficient science knowledge	29.8	54.2	13.7	14.8	53.6	19.9
Teachers do not know methods for teaching science	32.6	52.2	12.3	28.8	53.1	15.9
Lack of adequate consultant service	28.8	40.9	26.6	29.3	40.0	29.0
Teacher's lack of interest	41.4	46.5	9.3	41.4	45.2	12.4
What science to teach in each grade has not been clearly determined	60.8	27.7	9.3	65.8	22.8	10.4
School believes other areas more important than science	54.3	31.0	11.4	51.1	33.5	13.7
Not enough time to teach science	47.7	35.6	14.1	40.2	34.5	24.6
Lack of inservice opportunities	26.9	44.9	23.3	28.8	46.4	21.1

TABLE 90

CHARACTERISTICS OF TEACHER RESPONDENTS: PERCENT BY STATE AND REGION REPORTING CERTAIN DEGREES OF SATISFACTION WITH TEACHING ELEMENTARY SCHOOL SCIENCE[a]

State & Region	Sample Size	Degree of Satisfaction					Non-Response
		Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	
Illinois	158	20.9	39.2	15.2	20.3	3.2	1.3
Indiana	91	17.6	38.5	13.2	20.9	5.5	4.4
Michigan	131	24.4	31.3	8.4	23.7	7.6	4.6
Ohio	275	27.3	29.8	18.6	17.5	3.3	3.6
Wisconsin	68	23.5	41.2	16.2	17.7	1.5	0.0
Alaska	5	40.0	40.0	0.0	20.0	0.0	0.0
California	260	15.4	36.9	21.5	18.5	4.2	3.5
Hawaii	17	17.7	29.4	17.7	35.3	0.0	0.0
Nevada	10	10.0	20.0	20.0	10.0	30.0	10.0
Oregon	42	23.8	42.9	11.9	16.7	4.8	0.0
Washington	69	17.4	31.9	17.4	20.3	0.0	13.0
Region I	723	23.8	34.5	15.2	19.2	3.9	3.0
Region II	403	16.9	36.0	19.4	19.1	4.0	4.7

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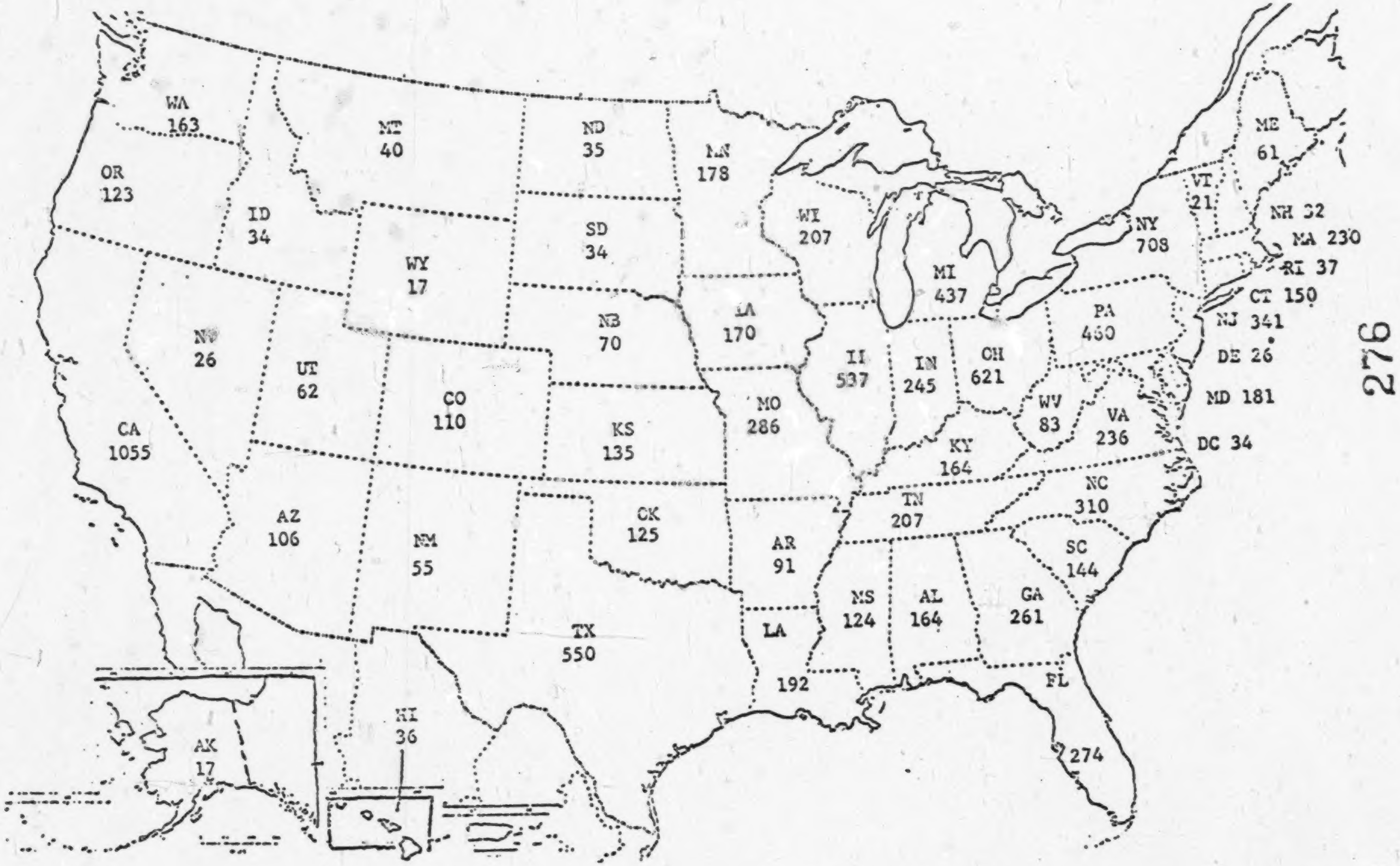
[a] Percentages may not equal 100 due to rounding.

APPENDIX B

SAMPLING PROCEDURES AND RELATED INFORMATION



Map Showing Number of Public Elementary Schools per State for Sampling in Model Design

TABLE 91

UNIT POPULATION VALUES FOR SAMPLING IN MODEL DESIGN

		Unit Population
1.	Alabama	5071
2.	Alaska	4204
3.	Arizona	3878
4.	Arkansas	4981
5.	California	4342
6.	Colorado	4766
7.	Connecticut	4214
8.	Delaware	4794
9.	District of Columbia	4382
10.	Florida	4948
11.	Georgia	4227
12.	Hawaii	4784
13.	Idaho	5261
14.	Illinois	4233
15.	Indiana	4919
16.	Iowa	3869
17.	Kansas	3869
18.	Kentucky	4260
19.	Louisiana	4503
20.	Maine	3805
21.	Maryland	4744
22.	Massachusetts	4836
23.	Michigan	4859
24.	Minnesota	5029
25.	Mississippi	4691
26.	Missouri	3296
27.	Montana	4319
28.	Nebraska	4695
29.	Nevada	4547
30.	New Hampshire	4553
31.	New Jersey	4168
32.	New Mexico	4955
33.	New York	4817
34.	North Carolina	3855
35.	North Dakota	4256
36.	Ohio	3839
37.	Oklahoma	4832

TABLE 91, cont.

		Unit Population
38.	Oregon	3982
39.	Pennsylvania	5021
40.	Rhode Island	4686
41.	South Carolina	4504
42.	South Dakota	4917
43.	Tennessee	4268
44.	Texas	4916
45.	Utah	4856
46.	Vermont	4745
47.	Virginia	4472
48.	Washington	4933
49.	West Virginia	4935
50.	Wisconsin	4609
51.	Wyoming	5059

ELEMENTARY SCIENCE TEACHER SELECTION METHOD

In order to ensure that the elementary school teachers who teach science constitute a random sample in this survey, we request your cooperation in selecting one elementary teacher who teaches science in your school to respond to the enclosed Elementary Teacher Questionnaire.

The method of selecting this teacher is as follows:

A. If you have only one teacher in your school who teaches at least one science course, class or subject in any grade level or combination of grade levels in any organizational pattern, give the enclosed Elementary Teacher Questionnaire to that teacher.

B. If you have more than one teacher who teaches science use the following procedure:

   1. Alphabetically order the last names of all teachers who teach at least one science course, class or subject in any grade level or combination of grade levels from Kindergarten through grade eight. They may teach science as any part of your school organizational pattern, such as ungraded, self contained, departmentalized, team teaching or traveling teacher.

   2. Please give the enclosed Elementary Teacher Questionnaire to one of your teachers on alphabetical list according to the following selection criteria:

Selection Numbers for Your School

09
04
02

      a. If the total number of elementary teachers who teach science in your school is greater than or equal to nine give the questionnaire to the ninth teacher on your alphabetical list.

      b. If the total number of teachers is less than nine but greater or equal to four, give the questionnaire to the fourth teacher on your list.

      c. If the total number of teachers is less than four but greater than or equal to two, give the questionnaire to the second teacher on your list.

Kindly request that the Elementary Teacher Questionnaire be returned to your office in the enclosed white envelope. In order that analysis can proceed quickly, please mail both completed questionnaires in the kraft clasp envelope at your earliest convenience.

THE OHIO STATE UNIVERSITY
COLLEGE OF EDUCATION
1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

Faculty of Science and
Mathematics Education

(614) 293-4121

Dear Principal:

Enclosed are two questionnaires from the Ohio State University National Science Teaching Study. The information requested from one of your elementary level teachers who teaches science and from yourself is vitally needed.

Over ten thousand schools are included in the present study. This is the largest study of its kind that has been done in science education. Each principal, like yourself, has been randomly selected to provide equitable representation among all elementary schools in the fifty states and the District of Columbia. Consequently, your own questionnaire responses are extremely important to an understanding of elementary science curricula.

This study is a research project of The Ohio State University Center for Science and Mathematics Education. Study results will be made available to agencies, such as the U. S. Office of Education ERIC Clearinghouse, that are responsible for information dissemination to researchers and curriculum personnel. Private foundations and legislators who provide financial support to education will also have access to final national survey results.

Your school name is needed on each questionnaire to ensure authenticity of the scientific survey sample. No evaluation will be made of individual schools nor will schools, principals or teachers be identified in the national report.

Both questionnaires have been designed for ease and convenience in response. Please feel welcome to make additional comments by letter or on the back of any questionnaire page.

The method for selecting a member of your faculty to complete the Elementary Teacher Questionnaire is indicated on the back of this letter. The selected teacher should seal the completed questionnaire in the enclosed white return envelope. This can be inserted in the kraft clasp envelope to be used for your questionnaire. We hope to have all questionnaires returned by April 15, 1971.

Your assistance in this significant study is appreciated. A complimentary summary of the study will be sent to you after data analysis.

Sincerely yours,

Jerrold William Maben

Jerrold William Maben
Graduate Research Associate
Coordinator, Central States

THE OHIO STATE UNIVERSITY
COLLEGE OF EDUCATION
1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

Faculty of Science and
Mathematics Education

Dear Teacher:

As a teacher who teaches science in your school, you have been selected by your principal to participate in The Ohio State University National Science Teaching Study. You are one of over ten thousand elementary school teachers in all fifty states and the District of Columbia who are responding to the attached questionnaire. The information which you can provide is extremely important.

The 1960's were marked by pressures and changes in elementary school science. Now knowledge is needed to summarize the decade. Equally significant, a scientific basis is required for future educational planning. Administrators, teachers, elected officials and universities seek factual answers to educational questions. Some of these are: 1. What science is being taught in our nation's elementary schools? 2. How many elementary students are receiving instruction in the various science programs? 3. Who are our elementary school science teachers? 4. What are the conditions for teaching science in today's schools?

The attached questionnaire has been designed for your convenience and ease in responding. Feel welcome to write any additional comments on the backs of the questionnaire pages.

Please complete the questionnaire at your earliest convenience. After you have finished, seal it in the enclosed white envelope and give it to your principal. It will be mailed back to me along with your principal's completed questionnaire.

Information from the national study will be made available to all interested individuals and groups. No evaluation will be made of individual teachers, principals or schools. None of these will be individually identified in the national report. Your principal will receive a summary of the report at the conclusion of this study.

Your assistance in providing the needed data is sincerely appreciated.

Cordially yours,

Jerrold William Maben

Jerrold William Maben
Graduate Research Associate
Coordinator, Central States

THE OHIO STATE UNIVERSITY
COLLEGE OF EDUCATION
1945 NORTH HIGH STREET
COLUMBUS, OHIO 43210

Faculty of Science and
Mathematics Education

(614) 293 4121

Dear Principal:

Your positive post card reply to my inquiry about your willingness to participate in The Ohio State University National Science Teaching Study is sincerely appreciated.

As you requested on the reply card, I am enclosing a new set of questionnaires for one of your teachers and yourself. The method to be used in selecting a classroom teacher is given on the back of the Principals Questionnaire cover letter.

Return addressed envelopes are also provided.

Thank you, again, for your contribution to this important national survey. Data on the 1970-1971 science program in your school will be a valuable addition to the study.

Cordially yours,

Jerrold William Maben

Jerrold William Maben
Graduate Research Associate
Coordinator

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ENC.

APPENDIX C

DATA GATHERING INSTRUMENTS

THE OHIO STATE UNIVERSITY
CENTER FOR SCIENCE AND MATHEMATICS EDUCATION
244 Arps Hall, 1945 North High Street
Columbus, Ohio 43210

SURVEY OF SCIENCE TEACHING IN PUBLIC ELEMENTARY SCHOOLS
1970-1971

PRINCIPAL'S QUESTIONNAIRE

☐☐ ☐☐☐ ☐☐☐

Principal's Name: ____________________

Name of School: ____________________

Address of School: ____________________
Number Street
____
City County
____
State Zip Code

General Instructions: This questionnaire is to be answered for an individual public elementary school, not for the school system at large. Please check over the questionnaire to get an idea of the scope of questions asked before beginning to fill out the form. Check (√) or fill in every item that applies.

Definition: For purposes of this survey a public elementary school is defined as "an educational institution, operated on public funds, under the principal or head teacher, including any combination of grade levels from K through 8, except any upper grades under a secondary school organization." This definition excludes all private, parochial or diocesean elementary schools, correctional schools, technical or vocational schools, and special schools for the blind, and physically or mentally-handicapped children.

I. SCREENING QUESTION

Is your school a public elementary school according to the above definition? (check one)

☐ Yes (If checked, continue with Item 1 of Section II.)

☐ No (If checked, indicate below what type of school yours is and disregard the rest of the questionnaire and mail it back to us.)

Type of School ____________________

II. SCHOOL ORGANIZATION AND SCHEDULING

1. What is the length of your regular school year? (Number of days classes are in session)

Number of Days____________

2. Give the enrollment for each grade level in your school as of Fall, 1970. Give also the total school enrollment. If you do not have students in a particular grade level, please leave the corresponding space blank.

Grade Level	Enrollment	Grade Level	Enrollment
K	____	5	____
1	____	6	____
2	____	7	____
3	____	8	____
4	____		

Total school enrollment ____________

3a. Indicate the prevailing way the children are organized for science in your school.

Grade	Standard Grades	Non-Graded
K	____	____
1	____	____
2	____	____
3	____	____
4	____	____
5	____	____
6	____	____
7	____	____
8	____	____

3b. In what grades and for what part of a school year is science taught as a definite part of the curriculum in your school?

Grade	Not Taught At All	Taught Less Than Half Year	Taught Half Year Only	Taught More Than Half Year
Kindergarten	____	____	____	____
First	____	____	____	____
Second	____	____	____	____
Third	____	____	____	____
Fourth	____	____	____	____
Fifth	____	____	____	____
Sixth	____	____	____	____
Seventh	____	____	____	____
Eighth	____	____	____	____

3c. Is your school departmentalized for teaching science at any grade level? (This means the children have a special science teacher at scheduled specified times each week) ☐ Yes ☐ No

If yes, check the grade or grades in your school in which science is departmentalized.

Grade	Departmentalized (Special Science Teacher)	Grade	Departmentalized (Special Science Teacher)
Kindergarten		Fifth	
First		Sixth	
Second		Seventh	
Third		Eighth	
Fourth			

IV. TEACHING STAFF

For Item 1 the following definitions apply:

Full-time teachers: those teachers who occupy teaching positions which require them to be on the job on school days, throughout the school year for at least the number of hours the schools in the system are in session.

Part-time teachers: those teachers who occupy teaching positions which require less than full-time service. This includes those teachers employed full-time for part of the school year, part-time for all of the school year, and part-time for part of the school year.

(Substitute teachers, defined as persons employed to teach on a day-to-day basis, temporarily replacing regularly employed teachers, are NOT considered as part-time teachers in this study.)

1. Specify the total number of regularly employed teachers (all grades) in your school.

Sex	Number Of Full-time Teachers	Number Of Part-time Teachers
Male		
Female		

2. Who teaches science to the children in your school? (Check All Boxes Which Apply)

Science Teaching In Your School	K	1	2	3	4	5	6	7	8
A. A classroom teacher with no help from an elementary science specialist or consultant	☐	☐	☐	☐	☐	☐	☐	☐	☐
B. A regular classroom teacher who teaches science classes for other teachers	☐	☐	☐	☐	☐	☐	☐	☐	☐
C. A special science teacher									
1. On the school staff	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. From central office staff	☐	☐	☐	☐	☐	☐	☐	☐	☐
D. A classroom teacher with help of elementary science specialist or consultant									
1. On the school staff	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. From central office staff	☐	☐	☐	☐	☐	☐	☐	☐	☐
E. Educational Television Science Programs Available	☐	☐	☐	☐	☐	☐	☐	☐	☐
F. Other (Specify) ______ ______	☐	☐	☐	☐	☐	☐	☐	☐	☐

V. SCIENCE BUDGET

1. Does your school have an annual budget for the purchase of new science equipment (excluding books)? ☐ Yes ☐ No

   If yes, total amount of money spent or committed for 1970-71. $________

2 Does your school have an annual budget for the purchase of consumable science supplies such as chemicals, batteries, balloons (excluding books)? ☐ Yes ☐ No

   If yes, total amount of money spent or committed for 1970-71. $________

3. Are your elementary teachers who teach science permitted to purchase equipment and supplies periodically throughout the school year? ☐ Yes ☐ No

4. Have you remodeled science facilities in your school with money from the National Defense Education Act (NDEA)? ☐ Yes ☐ No

   If yes, has this been since September 1968? ☐ Yes ☐ No

5. Have you used money from the National Defense Education Act (NDEA) to purchase science equipment? ☐ Yes ☐ No

   If yes, has this been since September 1968? ☐ Yes ☐ No

6. Have you used money from the Elementary and Secondary Education Act (ESEA) to purchase science equipment? ☐ Yes ☐ No

   If yes, has this been since September 1968? ☐ Yes ☐ No

7. Equipment is defined as non-consumable, non-perishable items such as microscopes, scales, models, aquariums, etc.
   Supplies are defined as perishable or easily breakable materials that must continually be replenished such as chemicals, dry cells, glassware, electric bulbs, cooper wire, etc.

   To what extent are equipment and supplies for science demonstrations and experiments available in your school? (check one only for each level)

	Completely Lacking	Inadequate	Adequate
Supplies			
K	☐	☐	☐
1-3	☐	☐	☐
4-6	☐	☐	☐
7-8	☐	☐	☐
Equipment			
K	☐	☐	☐
1-3	☐	☐	☐
4-6	☐	☐	☐
7-8	☐	☐	☐

8. What is the practice regarding the adoption of science textbook series? (check one box for each grade group in your school)

	K	1	2	3	4	5	6	7	8
No science textbook series adopted	☐	☐	☐	☐	☐	☐	☐	☐	☐
Single science textbook series adopted	☐	☐	☐	☐	☐	☐	☐	☐	☐
Two or more science series adopted	☐	☐	☐	☐	☐	☐	☐	☐	☐

9. In what type of room is science predominately taught in your school? (check one box for each grade level in your school)

Type of Room	K	1	2	3	4	5	6	7	8
A. Regular Classroom									
1. With no special facilities for science	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. With special facilities for science	☐	☐	☐	☐	☐	☐	☐	☐	☐
B. Special room to which children go for science	☐	☐	☐	☐	☐	☐	☐	☐	☐
C. Other (specify) ____________________ ____________________	☐	☐	☐	☐	☐	☐	☐	☐	☐

VI. COURSE OFFERINGS

1. Please specify the total number of children in your school by grade level(s) which use any Science Course Improvement Project materials during the 1970-71 school year. If particular course materials are not used in your school, please leave the corresponding spaces blank.

Science Course Improvement Project	Number of Children by Grade Level								
	K	1	2	3	4	5	6	7	8
SCIS-Science Curriculum Improvement Study (Rand McNally)									
ESS-Elementary Science Study (McGraw-Hill)									

1. (Continued)

Science Course Improvement Project	Number of Children By Grade Levels								
	K	1	2	3	4	5	6	7	8
AAAS-Science-A Process Approach (Xerox)									
COPES-Conceptually Oriented Program for Elementary Science (New York University)									
CSLS-Child Structured Learning In Science (Florida State University)									
IPS-Introductory Physical Science (Prentice-Hall)									
ISCS-Intermediate Science Curriculum Study (Silver Burdett)									
ESCP-Earth Science Curriculum Project (Houghton-Mifflin)									
ESSP-Elementary School Science Project (Astronomy) (University of Illinois)									
MINNEMAST-Minnesota Mathematics and Science Teaching Project									
IDP-Inquiry Development Program (Science Research Associates)									
TSM-Time-Space-Matter (McGraw-Hill)									
Other (Specify) ____________ ____________									

2a. Do you use definite procedures in your school for identifying children with special interests, aptitudes or talent in any area of your curriculum?

☐ Yes ☐ No

2b. Do you use definite procedures for identifying children with special interest in science? ☐ Yes ☐ No

3a. Is Environmental and/or Conservation Science taught in your school? ☐ Yes ☐ No

If yes, answer 3b. and 3c.
If no, go to Item 4a.

3b. Is Environmental and/or Conservation Science taught as a separate subject or in relation to other subjects? (Check in the appropriate space for each grade level)

Grade Level

	K	1	2	3	4	5	6	7	8
Taught separately	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with social studies	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects not including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (Specify) ________________ ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐

3c. Specify any facilities (such as an outdoor education laboratory, school farm, school forest...) that are available for teaching environmental and/or conservation science in your school.

____

____

____

4a. Is health taught in your school primarily as a separate subject or in relation to other subjects?

	K	1	2	3	4	5	6	7	8
Taught separately	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with physical education	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects not including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (Specify) ________________ ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐

4b. Is narcotics or drug abuse education taught in your school? ☐ Yes ☐ No

If yes, is it taught primarily as a separate subject or in relation to other subjects?

	K	1	2	3	4	5	6	7	8
Taught separately	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with health	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with physical education	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Taught with two or more subjects not including science	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (specify) ______________ ______________	☐	☐	☐	☐	☐	☐	☐	☐	☐

VII. INSERVICE EDUCATION

1a. In addition to assistance from the principal, is there other consultant or supervisory help in teaching science available from within the school system?

☐ Yes ☐ No

If yes, check items below which apply.

☐ General elementary supervisor with only general knowledge of science

☐ General elementary supervisor with special competence in elementary science

☐ Elementary science consultant, supervisor, or specialist

☐ Classroom teacher with special training or competence in science

☐ High school science teacher

☐ Other (Specify)

____

____

If you answered "No" to question 1a, DO NOT answer THIS question.

1b. If consultant help in science is available, to what extent do teachers make use of it? (Consider all types checked in question 1a and check only ONE box for each grade group in your school)

Grade	Rarely or Never (less than once a month)	Occasionally (about once a month)	Very Often (at least once a week)
K	☐	☐	☐
1	☐	☐	☐
2	☐	☐	☐
3	☐	☐	☐
4	☐	☐	☐
5	☐	☐	☐
6	☐	☐	☐
7	☐	☐	☐
8	☐	☐	☐

If you answered "No" to question 1a, DO NOT answer THIS question.

1c. If consultant help is available in your school, to what extent is each of the following ways of working used at each grade group level? Complete every box for grade groups in your school by writing in one of the numbers of the following code:

1 - Rarely or Never Used 2 - Used Occasionally 3 - Used Very Often

Consultant's Ways of Working	Grade Group K	1-3	4-6	7-8
Planning or consulting with teachers	___	___	___	___
Teaching science lessons within classrooms	___	___	___	___
Introducing science units	___	___	___	___
Providing materials	___	___	___	___
Helping plan field trips	___	___	___	___
Evaluation of science teaching	___	___	___	___
Demonstration teaching before teacher groups	___	___	___	___
Organizing or directing teacher workshops	___	___	___	___
Working with small groups of children	___	___	___	___
Other (Specify) ____________________	___	___	___	___

2. What are the opportunities teachers in your school have for in-service science education? (check as many boxes as apply for each function)

In-Service Science Education Activity	Sponsorship Local School Level	School System Level	State Level	College Sponsored	Any Other Sponsorship (Specify)
Teachers meetings					
Curriculum development and revision					
Elementary science courses					
Elementary science workshops					
Visitations and demonstration teaching					
Television and radio programs					
Other in-service science education activities (Specify) __________ __________ __________					

END OF PRINCIPAL'S QUESTIONNAIRE

THANK YOU FOR YOUR COOPERATION

THE OHIO STATE UNIVERSITY
CENTER FOR SCIENCE AND MATHEMATICS EDUCATION
244 Arps Hall, 1945 North High Street
Columbus, Ohio 43210

SURVEY OF SCIENCE TEACHING IN PUBLIC ELEMENTARY SCHOOLS
1970 - 1971

ELEMENTARY TEACHER QUESTIONNAIRE

☐☐ ☐☐☐ ☐☐☐

Teacher's Name (Optional) ____________________

Name of School: ____________________

Address of School: ____________________
Number Street

____
City County

____
State Zip Code

General Instructions: This questionnaire is to be answered by the individual elementary school science teacher. Please check over the questionnaire to get an idea of the scope of the questions asked before beginning to fill out the form. Check (✓) or fill in every item that applies.

I. TEACHER CHARACTERISTICS

Check (✓) or fill in the blank.

For Item 1, the following definitions apply:

Full-time teachers: those teachers who occupy teaching positions which require them to be on the job on school days, throughout the school year for at least the number of hours the schools in the system are in session.

Part-time teachers: those teachers who occupy teaching positions which require less than full-time service. This includes those teachers employed full time for part of the school year, part-time for all of the school year, and part-time for part of the school year.

Substitute teachers: those persons employed to teach on a day-to-day basis, temporarily replacing regularly employed teachers. They are not considered as part-time teachers in this study. If you are a substitute teacher, please return this questionnaire to your principal.

1. On what basis are you now employed by the school system?
   Full-time ☐ Part-time ☐

2. Sex: Male ☐ Female ☐ Age in years: ___

3. a) Number of years of teaching experience in an elementary school (include the present school year): ____________

b) Number of years of teaching experience in a secondary school: _____

c) Number of years you have taught any science in an elementary school (include the present school year): _____

d) Number of years at present school system or district (include the present school year): _____

4. Please check the degree(s) you now hold, and specify the major and minor subject matter fields of the degree(s).

Degrees Held		Subject Matter Fields	
		Major	Minor(s)
B.S. or B.A.	☐		
M.S. or M.A.	☐		
Ed.D.	☐		
Ph.D.	☐		
Specialist	☐		
Non-degree	☐		
Other (specify) _____	☐		

5. Are you now working on a formal degree program? ☐ Yes ☐ No.

If yes, what degree? _____

Major subject matter field _____

Minor subject matter field(s) _____

6. Please specify the number of credits you have in the following areas in either quarter hours or semester hours.

Undergraduate Work	Quarter Hours	Semester Hours
Biological Sciences		
Physical Sciences		
Earth Science		
Mathematics		
Science Teaching Methods		
Student Teaching in Science		
Graduate Work		
Biological Sciences		
Physical Sciences		
Earth Science		
Mathematics		
Science Teaching Methods or Science Education		

7. If you have attended any sponsored science in-service activities since September, 1968, please indicate the year(s) in which you attended the program in the appropriate column below.

In-service Science Education Activity	Sponsorship					
	local school level	school system level	state level	national level	college sponsored	any other sponsorship (specify)
Teachers' meetings						
Curriculum development and revision						
Elementary science courses						
Elementary science workshops						
Visitations and demonstration teaching						
Television and radio programs						
Other in-service science education activities (specify) ____________ ____________ ____________						

8. If you teach or have taught one or more of the science course improvement projects (e.g., ESS, SCIS, AAAS, MINNEMAST, COPES, TSM, IDP, ISCS, ESCP, CSLS), since September, 1968, please supply the following information about each project.

Science Course Improvement Project	Attendance at Workshop or Institute		Length of Workshop or Institute
	Yes	No	
____________	☐	☐	________
____________	☐	☐	________
____________	☐	☐	________
____________	☐	☐	________

II. SPECIAL SCIENCE FACILITIES AND AUDIO-VISUAL AIDS

1. Check the special science facility or facilities available for your use in teaching science in your elementary school. How much use do you make of each facility that is available?

Special Science Facility	Availability		Usage		
	Yes	No	Rarely or Never (less than once a month)	Occasionally (about once a month)	Very Often (at least once a week)
Auto-tutorial laboratory	☐	☐	☐	☐	☐
Closed circuit television	☐	☐	☐	☐	☐
Computer terminals	☐	☐	☐	☐	☐
Greenhouse	☐	☐	☐	☐	☐
Observatory	☐	☐	☐	☐	☐
Outdoor laboratory	☐	☐	☐	☐	☐
Planetarium	☐	☐	☐	☐	☐
Science darkroom	☐	☐	☐	☐	☐
Science museum	☐	☐	☐	☐	☐
Ventilated animal housing	☐	☐	☐	☐	☐
Weather station	☐	☐	☐	☐	☐
Other (specify) ________	☐	☐	☐	☐	☐
____________________ ____________________			☐	☐	☐

2. Equipment is defined as non-consumable, non-perishable items, such as microscopes, scales, models, aquariums, etc.

   Supplies are defined as perishable or easily breakable materials that must continually be replenished such as chemicals, dry cells, glassware, electric bulbs, copper wire, etc.

   To what extent are equipment and supplies for science demonstrations and experiments available in your school (check only one)?

	Completely Lacking	Inadequate	Adequate
Supplies	☐	☐	☐
Equipment	☐	☐	☐

3. Check the audio-visual aids that are available to you in teaching science. How much use do you make of each kind of aid that is available?

Audio-Visual Aid	Availability		Usage		
	Yes	No	Rarely or Never (less than once a month)	Occasionally (about once a month)	Very Often (at least once a week)
Motion picture projector	☐	☐	☐	☐	☐
Filmloop projector	☐	☐	☐	☐	☐
Slide projector	☐	☐	☐	☐	☐
Overhead projector	☐	☐	☐	☐	☐
Opaque projector	☐	☐	☐	☐	☐
Micro-projector	☐	☐	☐	☐	☐
Phonograph	☐	☐	☐	☐	☐
Tape-recorder	☐	☐	☐	☐	☐
Television	☐	☐	☐	☐	☐
Commercial models (e.g., molecular, eye, ear models...)	☐	☐	☐	☐	☐
Commercial charts	☐	☐	☐	☐	☐

III. MISCELLANEOUS

1. What degree of difficulty do the following factors offer to effective science teaching in your school? Complete all boxes using the following code:
   - 3 - Great Difficulty
   - 2 - Some Difficulty
   - 1 - No Difficulty

Factors	Degree
Inadequate room facilities	___
Lack of supplies and equipment	___
Insufficient funds for purchasing needed supplies, equipment, and appropriate science reading materials	___
Lack of community support for science program	___
Inability of teachers to improvise materials and equipment	___
Teachers do not have sufficient science knowledge	___
Teachers do not know methods for teaching science	___
Lack of adequate consultant service	___
Teachers lack interest	___
What science to teach in each grade has not been clearly determined	___
School believes other areas more important than science	___
Not enough time to teach science	___
Lack of in-service opportunities	___
Other (Specify) ________________________________	
____	___

IV. ELEMENTARY SCIENCE TEACHING

SPECIAL INSTRUCTION: Section IV, Items 1, 2, 3, 4, 5, and 6 below have been designed to provide information specific to one science class. If you teach only one class of science, such as in a self-contained organization, you may skip directly to item 1 below, and respond to these same items in relation to that class.

IF YOU TEACH MORE THAN ONE SCIENCE CLASS, PLEASE READ THE FOLLOWING BEFORE YOU BEGIN ITEM 1.

The method given below is provided for only those elementary teachers who teach more than one group of science students in organizational patterns such as team teaching, ungraded, departmentalization, traveling teacher, etc.

In order to ensure that the elementary school science classes in this survey constitute a random sample, we request your cooperation in selecting one of your science classes, about which we hope to obtain specific information regarding the science teaching practices.

The method of selecting this science class from all your science classes is outlined below. In selecting a science class for the information needed in Section IV, Items 1-6, of the questionnaire, treat each group of students or unit as a separate class.

A) Order your science classes in numerical order, starting with "1" for the first science class that you teach each day, "2" for your second science class, and so on, ending with your last science class for the day.

B) Please select one of the science classes on your list according to the following selection criteria:

Science Class Selection Numbers

05
03
02
01

a) If the total number of science classes that you teach is greater than or equal to 5, select the 5th science class.

b) If the total number of science classes that you teach is less than 5 but greater than or equal to 3, select the 3rd science class.

c) If the total number of science classes that you teach is 2, select the 2nd science class.

1. a) How many students are in *this class*? ______

   b) Grade level(s): ______

   c) How many times per week do you usually teach science to *this class*? ______

   d) How many minutes per week does *this class* usually receive science instruction? ______

I

2. What pattern of science teaching most aptly describes the approach you use with *this class*?

   a) Separate subject ☐

   b) Integrated with other subject ☐

   c) Incidentally ☐

   d) Combinations:
      1) Separate subject and incidental ☐
      or
      2) Integrated and incidental ☐

   e) Other (Specify) ____________ ☐
   ____

3. Which of the following best describes your role as teacher of *this class*?

   a) A classroom teacher with no help from an elementary science specialist or consultant ☐

   b) A regular classroom teacher who teaches science classes for other teachers ☐

   c) A classroom teacher with help of elementary science specialist or consultant who is:

      1) on the school staff ☐

      2) from central office staff ☐

   d) A special science teacher

      1) on the school staff ☐

      2) from central office staff ☐

   e) A classroom teacher who coordinates science instruction with educational television ☐

   f) Other (Specify) ____________ ☐
   ____

4. Please check the kind of room that you use to conduct *this class*.

   Laboratory or special science room ☐

   Classroom with portable science kits ☐

   Classroom with no science facilities or kits ☐

   Other (Specify) ____________ ☐

5a. Please check the kind(s) of curriculum materials and/or textbooks that you use for *this class.*

Single textbook including laboratory manual ☐

Single textbook ☐

Multiple textbooks including laboratory manuals ☐

Multiple textbooks ☐

Locally prepared materials ☐

Separate laboratory manual ☐

Other (Specify) ________ ____________________ ☐

5b. Please supply the following information about the textbook(s) and/or curriculum materials used for *this class.* If space is insufficient, please continue on the back of this sheet or attach a separate list.

Title	Publisher	Publication Date

5c. If you are using materials of any science course improvement project (i.e., SCIS, AAAS, ESS, COPES, IDP, ESCP, etc.) in *this class*, please indicate the materials used and the extent to which they comprise the total science program for *this class.*

Name of Science Course Improvement Project	Materials Used		Portion of Science Course for *This Class*			
	Printed	Kits	Less than Half	About Half	More than Half	Total Course
____________	☐	☐	☐	☐	☐	☐
____________	☐	☐	☐	☐	☐	☐
____________	☐	☐	☐	☐	☐	☐

6. With respect to *this class*, rank the three learning activities that you use most often. Use "1" for the most often used activity, "2" for the next most often, and "3" for the third most often used activity. Mark all other activities which you use with a check (✓).

Lecture ____

Lecture-discussion ____

Small group discussion ____

Science demonstrations ____

Instructional films ____

Independent study ____

Others (Specify)

____

____

Individual laboratory activity ____

Group laboratory activity ____

In-class written assignments ____

Excursions or field studies ____

Programed instruction ____

Auto-tutorial instruction ____

Televised instruction ____

7. How satisfied are you with teaching elementary school science?

Very satisfied ☐

Satisfied ☐

Neutral ☐

Dissatisfied ☐

Very dissatisfied ☐

END OF TEACHER'S QUESTIONNAIRE

THANK YOU FOR YOUR COOPERATION

Dear Principal:

Recently, two questionnaires were mailed to you from The Ohio State University National Science Teaching Study. Information was requested from one of your teachers and yourself.

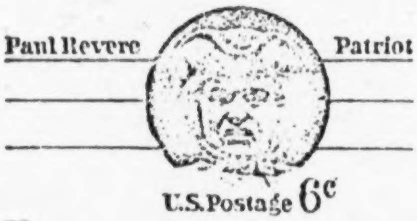
Overall response has been very good. However, we have not received Principal or Teacher Questionnaires from your school. Your data is important since we wish to obtain representative information from your geographic area.

Please check the appropriate box on the reply card. Either detach and mail, or fold, staple, and mail.

Sincerely yours,

Jerrold William Maben

Jerrold William Maben
Graduate Research Associate



National Science Teaching Study
The Ohio State University
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Columbus, Ohio 43210

Please check the appropriate box:

☐ Questionnaires have been returned to you.

☐ Questionnaires will be completed and mailed about ______________.

☐ Questionnaires have been received, but we are unable to participate in this National Study.

☐ Questionnaires have not been received. Please send another set.

Comments: ______________________________

____

☐ ☐☐ ☐☐☐ ☐☐☐

APPENDIX D

INFORMATION REGARDING EXTENDED PHASES OF THE NATIONAL NATIONAL ELEMENTARY SCHOOL SCIENCE STUDY AND THE NATIONAL SECONDARY SCHOOL SCIENCE STUDY

The present study was one part of the National Elementary School Science Study. The study sought to survey the status of elementary school science during the 1970-1971 school year in all 50 states and the District of Columbia. The general design of the study was discussed in Chapter III. The elementary study was conducted concurrently with the National Secondary School Science Study. Additional information on either study may be obtained from:

ERIC Center for Science and
  Mathematics Education
The Ohio State University
1460 West Lane Avenue
Columbus, Ohio 43221

APPENDIX E

RECOMMENDATIONS

RECOMMENDATIONS

The recommendations are presented in three groups: 1) use of the information from the present study for policy making by federal, state or local agencies; 2) recommendations related to further analysis of the schools from which data in the present study were obtained; and 3) recommendations related to further analysis of the data obtained by the present study.

For Educational Policy

Policies for utilization of federal funds should be examined in relation to regional differences found in the present study. These policies would include those existing at federal, state and local levels. It is possible that one or more of these agency levels would have developed policies which have resulted in the indicated regional differences. It is likely that a more equitable usage of federal funds for science instruction could be achieved.

It also seems that changes can be made in policy regarding teacher education. Science and science education courses at the undergraduate level need to provide ways to help teachers develop better feelings toward their adequacy in these areas. This is especially true for graduate level science and science education courses. Overt recruitment of teachers to enroll in these courses by offering content that will be regarded as valuable by the teachers is needed.

Inservice education requires similar changes if teachers are to gain knowledge of and use of methods that will better utilize available science materials and facilities. Learning activities for children should involve more than textbook reading. Every science series provides teachers with a multitude of suggestions for individual activity, small group work, demonstrations, experiments and field trips. An enriched variety of inservice and consultant services is needed to help teachers make the resources now available to them an integral part of elementary school science instruction. Such training will also provide mechanisms for implementing usage of materials from science course improvement projects and of other curriculum materials as they are developed.

For Further Analysis of the Schools Studied

Additional data could be obtained to provide a more complete picture of the nature of elementary school science in these schools. Much descriptive data has already been acquired and analyzed concerning administrative practices, faculty, facilities, equipment and learning activities. Study of the quality of science learning in these schools could utilize the present data to determine if an association exists between the results of the respective science programs against the variables analyzed in the present study.

Of particular interest would be those schools in the present study that had implemented science course improvement projects, had special facilities for science instruction or had integrated environmental education or other subjects with science. It is possible that specific factors are operative in these schools which resulted in the programs or facilities.

Trend analysis could also be conducted by surveys which seek to obtain data similar to the present study after certain intervals from the same schools surveyed in the present study. Approximately every five years would seem appropriate.

For Further Analysis of the Data

Further analysis of the data can be made to examine several aspects of the characteristics of teachers who taught elementary school science in the schools from which the data were received. For example, analysis can be made to determine if an association exists between teacher age, teacher experience or teacher academic background and experience and/or training in science course improvement projects.

An examination of the types of master's degrees, and graduate majors of those who teach science in relation to school enrollment size is also recommended. A detailed examination can be made of teacher participation in the various types of inservice education activities. Differences in responses on the teacher questionnaires, particularly in regard to background, learning activities, use of special science facilities, textbook usage and satisfaction with elementary science teaching can be analyzed for association with teacher sex.

Examination of the data for differences associated with grade level could be conducted and inclusion of data acquired for grades seven and eight could be made.

It also seems likely that since the basic data of this study was obtained for a large number of schools on a variety of variables, it would be useful for other educational researchers to utilize this material as a data bank with other studies for comparison purposes on specific variables, trend analysis, design implementation of model studies, piloting of experimental designs and identification of significant variables.

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